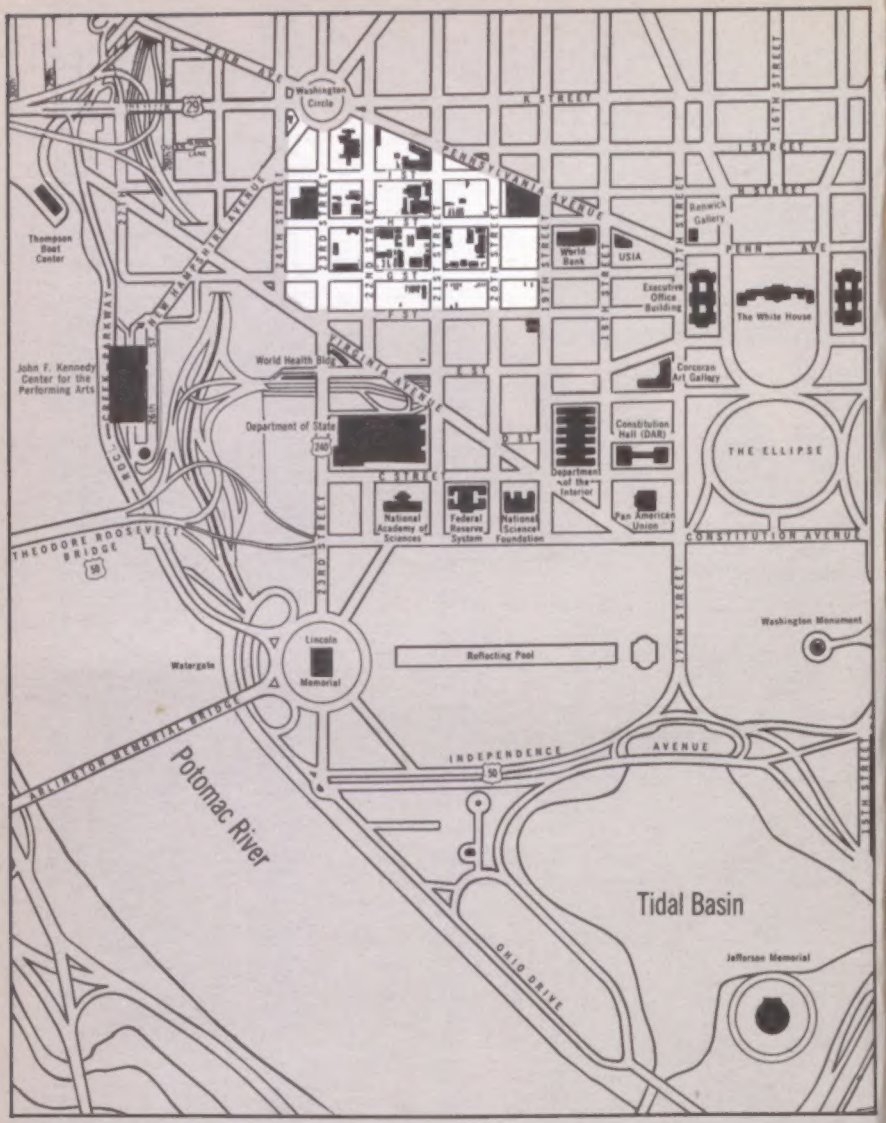
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E GEORGE WASHINGTON UNIVERSITY BULLETIN
ume LXXIX, Number 3, May 1980

DERGRADUATE AND GRADUATE PROGRAMS
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THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D. C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

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HE GEORGE WASHINGTON UNIVERSITY BULLETIN

UNDERGRADUATE AND GRADUATE PROGRAMS 1980-1981

ARTS AND SCIENCES, EDUCATION AND HUMAN DEVELOPMENT, GOVERNMENT AND BUSINESS ADMINISTRATION, PUBLIC AND INTERNATIONAL AFFAIRS

This *Bulletin* lists the programs and faculties of Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, the School of Public and International Affairs, and the Division of University Students.

For information concerning the School of Engineering and Applied Science, the National Law Center, the School of Medicine and Health Sciences, the College of General Studies, or the Summer Sessions, please request the appropriate bulletin.

UNIVERSITIES are undergoing change, either drastically o slowly, as they have been for centuries. Whatever the changes, th one premise on which universities are based remains constan universities are for learning—for acquiring learning, for transmittin learning, and for the exploration that yields new learning. Any othe objective is unworthy of a university, and any other purpose incompatible with the best interests of students and their relatio ship to the institution.

The faculty, through scholarship and research, extends learnin and it transmits learning by teaching. Students learn from th faculty, the library, and the laboratory—if they accept, as they mus learning as their objective. This learning does not take place in vacuum; in addition to the particular content of learning, student will develop certain habits of mind—analytical thinking, powers o insight, self-examination, and the use of rational discourse—tha will serve them throughout their personal and professional lives.

Within this basic context, George Washington University invite students to take up their residence in order that their energies, in terests, and talents may be directed to learning.

Exceptional opportunities for learning are made possible becaus of the University's location in the heart of the nation's capital. Fo example, cooperative programs are conducted in various fields o study with members of Congress, the Smithsonian Institution, th Library of Congress, the National Gallery of Art, and other federa and private organizations. In addition to these programs, Washingto presents opportunities for observation, study, service, and recrea tion limited only by students' time, energy, and imagination.

In this atmosphere, George Washington University seeks to pro vide a matrix for learning not available in the standard universit education, so that graduates can never forget that as students the were at the center of government and that they must forever carr additional responsibility in and for society, because of the oppo tunity that was theirs.

The George Washington Universit
LLOYD H. ELLIOTT
President

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1980 **1981**

AUGUST

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1980 **FALL SEMESTER**

August 25 Orientation begins for students from foreign countries and for freshmen who did not attend Summer Advance Registration Program

August 26 Placement tests and advising for entering freshmen who did not attend Summer Advance Registration Program

Orientation begins for transfer students

August 27 Placement tests and advising for transfer students

Advising for sophomores, juniors, and seniors in the School of Government and Business Administration

† *August 28-30* Registration; application for February graduation due as part of registration

September 1 Labor Day (holiday)

September 2 On-campus classes begin

September 3 University Faculty Assembly meeting

* The Academic Calendar is subject to change.
† The registration procedure and the hours of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

September 8	Off-campus classes begin
September 12	Applications due for October Ed.D. Comprehensive Exam nations Faculty Senate meeting
October 8	Applications due for November Master's Comprehensiv Examinations in the School of Public and Internationa Affairs and in the School of Government and Busines Administration
October 10	Faculty Senate meeting
October 11	Ed.D. Comprehensive Examinations
October 16	Board of Trustees meeting
November 3	Applications due for spring semester financial aid
November 7	Applications due for Ed.D., Ed.S., and M.A. in Ed. Com prehensive Examinations
November 7-8	School of Public and International Affairs and School o Government and Business Administration Master's Com prehensive Examinations
November 14	Faculty Senate meeting
November 17	D.B.A., D.P.A., and Ph.D. dissertations due from Februar candidates
November 26	Thanksgiving holiday begins after last class
December 1	Classes resume
December 2	Last day of fall semester on-campus classes
December 6	Ed.D., Ed.S., and M.A. in Ed. Comprehensive Examination
December 8-17	Examination period
December 12	Faculty Senate meeting
December 19	Last day of fall semester off-campus classes
1981	**SPRING SEMESTER**
January 2	Master's theses and Ed.D. dissertations due from Februar candidates
January 5	Orientation for students from foreign countries
January 6-7	Orientation for new students; advising for all students
January 7	All degree requirements to be completed and reported t the Graduate School of Arts and Sciences for Februar graduation
* *January 8-10*	Registration; application for May graduation due as par of registration
January 9	Applications due for February Ed.D. Comprehensive Exami nations
January 12	Spring semester on-campus classes begin
January 15	Board of Trustees meeting
January 16	Faculty Senate meeting
January 19	Spring semester off-campus classes begin
January 20	Inauguration Day (holiday)
January 21	University Faculty Assembly meeting
February 2	Deadline for submission of 1981-82 freshmen student finar cial aid applications

* The registration procedure and the hours of registration will be stated in the *Schedule* Classes, which is available well in advance of each semester.

February 13	Faculty Senate meeting
February 16	Winter Convocation (holiday)
February 21	Ed.D. Comprehensive Examinations
March 2	Deadline for submission of 1981-82 undergraduate continuing and transfer student financial aid applications
	Ph.D. dissertations due from May candidates
March 4	Applications due for April Master's Comprehensive Examinations in the School of Public and International Affairs and the School of Government and Business Administration
March 7	Spring recess begins after last class
March 13	Applications due for Ed.D., Ed.S., and M.A. in Ed. Comprehensive Examinations
	Faculty Senate meeting
March 16	Classes resume
	Ed.D. dissertations due from May candidates
March 19	Board of Trustees meeting
March 23	D.B.A. and D.P.A. dissertations due from May candidates
April 1	Deadline for submission of Summer Sessions and 1981-82 graduate financial aid applications
April 10	Faculty Senate meeting
April 10-11	School of Government and Business Administration and School of Public and International Affairs Master's Comprehensive Examinations
April 13	Master's theses due from all May candidates except those in the School of Public and International Affairs
April 16	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation
April 17	Master's theses due from May candidates in the School of Public and International Affairs
	Last day of spring semester on-campus classes
April 18	Ed.D., Ed.S., and M.A. in Ed. Comprehensive Examinations
April 23-May 2	Examination period
April 27	Last day of spring semester off-campus classes
May 1	Last day for current master's degree candidates in the Graduate School of Arts and Sciences to apply for Ph.D. programs
	Faculty Senate meeting
May 3	Commencement
May 21	Board of Trustees meeting

FACTS ABOUT GEORGE WASHINGTON UNIVERSIT

General Information	Private, nonsectarian, coeducational founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-campus Students	8,742 full-time; 8,410 part-time (equivalent to 12,646 full-time students altogether)
Geographical Origin of Students	50 states, District of Columbia, 120 countries
1980-81 Tuition	Undergraduate: $3,400 for two semesters; graduate: $125 for each semester hour (see page 28)
Number of Full-time Faculty	1,043 (82% with doctoral degrees)
Number of Part-time Faculty	525 (includes some of the most distinguished men and women in Washington)
Residence Hall Space	2,070
Room and Board	Cost varies from approximately $2,3 to $2,710 for the academic year (see pages 59-60)

Undergraduate majors: Accounting, American Civilization, American Literatur Anthropology, Applied Mathematics, Applied Statistics, Art History, Biolog Botany, Business Administration, Cartography, Chemistry, Chinese Langua and Literature, Civil Engineering, Classical Archeology and Anthropolog Classical Archeology and Classics, Classical Humanities, Computer Scienc Dramatic Art, Early Modern European Studies, East Asian Studies (China Japan), Economics, Electrical Engineering, Elementary Education, English Liter ture, Environmental Studies, Fine Arts, French Language and Literatu Geodesy, Geography, Geology, Germanic Languages and Literatures, Histo Human Kinetics and Leisure Studies, International Affairs, Journalism, Jud Studies, Latin American Studies, Liberal Arts, Mathematical Statistics, Math matics, Mechanical Engineering, Medical Technology, Middle Eastern Studi Middle School Education, Music, Nursing Anesthesia, Nurse Practitioner P gram, Oceanography, Operations Research and Computational Science, Philos phy, Physician's Assistant Program, Physics, Political Science, Premedici Psychology, Public Affairs, Radio-Television, Radiologic Sciences and Admin tration, Religion, Russian Language and Literature, Russian Literature a Culture—in Translation, Secondary Education, Sociology, Spanish Americ Literature, Spanish Language and Literature, Speech Communication, Spe Pathology and Audiology, Urban Affairs, Zoology.

Study leading to graduate or professional degrees is offered in the Gradu School of Arts and Sciences, the National Law Center, the School of Medic and Health Sciences, the School of Engineering and Applied Science, the Sch of Education and Human Development, the School of Government and Busin Administration and the School of Public and International Affairs.

THE UNIVERSITY

HISTORY

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company, "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended a "fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye

Streets, and Washington selected Twenty-third and E Streets as the site of the National University he hoped to see established.

PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "the aspirations of Washington, Jefferson and Madison, for the erection of a university at the seat of the Federal Government." Over the years it has been the aim to develop the University ideal in the nation's capital with a view toward meeting the changing needs of society while continuing to pursue the traditional principles of learning and research.

The George Washington University now rededicates itself and all the resources at its command to the pursuit of knowledge and its dissemination.

To this end:

The University recognizes its special opportunities in and obligations to one of the principal capitals of the world. It is a primary objective of the University to utilize its historical, geographical, and functional relationship to the nation's capital and the Washington community in continuing the development of a great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge to develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian and coeducational.

Admission to the University is determined only in terms of the personal character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of the University.

Expansion of graduate and professional studies and research and the utilization for this purpose of the excellent research facilities and materials available in the nation's capital are basic to the continuous development of the University's educational program.

The provision of superior instruction and facilities and the application of high standards of entrance qualifications and academic achievement to all students whether full-time or part-time, on-campus or off-campus, are major missions of the University.

A balanced program of student extracurricular activities is an integral part of the University program.

The University will continue to strive to meet the evident needs of an enlarged student body while governing the size of enrollment by its capacity to supply adequate staff and facilities for the excellent teaching and research which it espouses.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 11 colleges, schools and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides prelegal and premedical programs, and the preprofessional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Bachelor of General Studies, Bachelor of Science in Geodesy, Bachelor of Science in Cartographic Science, and Bachelor of Science in Oceanography. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences†‡ offers advanced study and research leading to the degrees of Master of Arts, Masters of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs administered by the College of General Studies.

The School of Medicine and Health Sciences†† offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center‡ offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, and mechanical engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education and Human Development, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education and Human Development is also available through off-campus programs administered by the College of General Studies.

The School of Government and Business Administration‡ offers under-

* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

‡ The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

graduate programs leading to the degrees of Bachelor of Business Administration and Bachelor of Science in Health Care Administration; graduate programs leading to the degrees of Master of Accounting, Master of Business Administration, Master of Health Services Administration, Master of Public Administration, Master of Science in Information Systems Technology, Master of Urban and Regional Planning, Postmaster's Graduate Certificate in Health Services Administration, Doctor of Business Administration, and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts.

The College of General Studies supplements the adult education program of the University through campus and off-campus study; conferences, seminars, and special projects; and continuing education and noncredit programs. This College also administers the off-campus programs over which Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, and the School of Government and Business Administration have academic jurisdiction.

The Division of University and Summer Students makes courses available during the regular academic year and the summer to those who are not currently degree candidates at the University.

The Division of Experimental Programs supports University-wide curricular experimentation and development, especially the development of new courses and new programs that entail interdisciplinary or interschool cooperation or that utilize educational resources in the Washington community.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association. The School of Medicine and Health Sciences is a member of the Association of American Medical Colleges and is one of the medical colleges which have been continuously approved by the American Medical Association. Undergraduate curricula of the School of Engineering and Applied Science in civil, electrical, and mechanical engineering are accredited by the Engineers' Council for Professional Development. The School of Education and Human Development is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Ad-

* The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts

ministration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business and, in 1977, its undergraduate program was accredited by the Assembly. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in hospital administration is accredited by the National Accrediting Commission on Graduate Education for Hospital Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners. The Department of Chemistry is on the approved list of the American Chemical Society. The Department of Music is an accredited member of the National Association of Schools of Music. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech-language pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of sex, race, color, religion, national origin, or handicap in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 and the Rehabilitation Act of 1973 call for an explicit statement that the requirement not to discriminate on the basis of sex or handicap extends to employment in and admission to such programs and activities. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office for Civil Rights of the Department of Health, Education, and Welfare.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the University Library (the general library of the University) and in the libraries of the

Institute for Sino-Soviet Studies, the National Law Center, and the Schoo of Medicine and Health Sciences.

These collections contain approximately 800,000 volumes, to which ar added some 40,000 volumes a year. Endowments supplementing the Un versity appropriation provide books in the fields of American civilizatio American literature, foreign service, history, public finance, and the soci sciences; and gifts from many sources have enriched the collections. Th libraries currently receive about 8,000 serials.

Information concerning the use of the libraries may be obtained at th library service desks.

The library is administered for the curricular, reference, and recre tional needs and interests of the students. Instruction in the use of th library is given upon request by the reference librarians. The library en deavors to assist students and all members of the University to use th rich library resources of Washington and the unusual opportunities the offer for extensive research. Interlibrary loan arrangements are main tained with other libraries in the city and throughout the United State

The student has access to the Library of Congress, the Public Librar of the District of Columbia and its branches, and many of the speci collections of the government departments. Graduate students at Georg Washington University may, upon application, be issued a Consortiu library card which permits direct borrowing from the libraries of th other Consortium Institutions.

THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board Trustees of which the President of the University is an ex *officio* membe

---

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Astere Evarist Claeyssens, Jr.
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Marvin Gordon
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Janet Craig Heddesheimer
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Stefan Otto Schiff
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Reuben Esselstyn Wood
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† Ex officio member
‡ Chairman of the Executive Committee

ADMISSION

The University accepts both men and women. Students are admitted the beginning of each semester and summer session.

An application for admission to degree candidacy should be acco panied by a $15 (for undergraduate study) or $25 (for graduate stud application fee.* The application fee is waived for graduates of this U versity applying to the Graduate School of Arts and Sciences and students applying for readmission who were registered as degree can dates at the time of their last registration at this University and who ha not since registered at another institution.

Applicants are urged to submit the application form and complete c dentials well in advance of the semester for which they seek admissio Specific dates are given in each section below.

Acceptance is based on space available and a prediction of potential successful study. The following criteria are considered: degree or maj objective related to rigor of program and grades achieved in seconda school or college, standardized test scores, relationship between grad and test scores, and recommendations.

The right is reserved to refuse admission to any student with an ac demic record which creates doubt of ability to succeed in college or wh for any other reason, would not be an acceptable student. In the selecti process, there is no discrimination because of sex, race, color, religio handicap, or national origin.

UNDERGRADUATE ADMISSION†

Forms for application for admission or readmission to undergraduate nondegree status are available at and should be returned to the Office Admissions, George Washington University, Washington, D.C. 20052.

Secondary School Students

Applicants who wish to begin college in the fall semester or in a summ session should apply during the fall term of the senior year in high scho Preference will be given to students who submit applications and require credentials prior to March 1. Students graduating at mid-year who wi to begin college in the spring semester should apply no later than N vember 1.

Early Notification—Although decisions on most applications for the f semester will require submission of seventh-term grades and senior-ye test scores, an earlier decision will be given after September 1 to studen whose applications become complete with secondary school recor

* Application fee must be by check or postal money order, payable to George Washington U versity.

† For detailed admission requirements, see the appropriate college or school in this *Bulleti* Tests required for admission are described on pages 75 and 138. See pages 25-26 for admiss requirements for students from foreign institutions

rough the junior year and junior-year test scores, provided these records early establish admissibility.

Early Admission Plan—Unusually well-prepared students who have ompleted the junior year in high school may be considered for admis-ion. This plan is designed for those students who, in terms of academic reparation and emotional maturity, are ready to enter college. More ften than not, students interested in early admission have substantially xhausted the high school offerings in several academic areas. For such tudents, remaining in high school for the senior year would not be in heir best interest, nor in the best interest of the school.

To be considered for early admission, students must:

1. meet most of the secondary school requirements for graduation and omplete the University's required entrance units (see page 68),
2. have the unqualified recommendation of the secondary school princi-al or counselor,
3. submit two letters of recommendation (in addition to the counselor's) rom teachers who can testify to the student's maturity and general readi-ess to enter college,
4. submit SAT or ACT scores.

The student's chances for admission will be improved if scores of CEEB chievement tests or Advanced Placement Tests in subjects taken in the ophomore year are submitted.

Applicants from a secondary school must arrange to have sent directly rom their schools to the Office of Admissions a complete academic record ogether with a personal evaluation and recommendation from the princi-al. This information should be supplied on a standard form used by the econdary school.

Transfer Students

Undergraduate transfer students from other institutions should submit ap-lication and required credentials prior to June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been academically dismissed or suspended more than one time normally will not be considered for admission.

An applicant who has attended one or more institutions of higher learn-ng must request each registrar to mail directly to the Office of Admissions a transcript of his or her record, *even though credits were not earned.*

If high school units are not shown on the college transcript, the appli-cant must request that the high school record be sent to the Office of Admissions.

If an applicant has fewer than 30 semester hours of acceptable work (C or better in academic courses from an accredited institution) at the time the application is submitted, the applicant must request that his or her high school record and College Entrance Examination Board or ACT test scores be sent to the Office of Admissions.

Advanced Tuition Deposit

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students including those readmitted.

This deposit is not due until May 1 for students entering in the fall s
mester or until December 15 for students entering in the spring semest
The deposit is credited toward tuition and is not refundable.

Advanced Standing and Advanced Placement

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work
examination, credit may be granted for work successfully completed
accredited institutions of higher learning. Although transfer credit may
assigned, it must meet requirements for the degree sought in order to
counted towards that degree. Credit may be accepted provisionally. Wo
of low-pass grade (*D* or the equivalent) will not be considered for transf

Except for students transferring to the School of Government and Bu
ness Administration or to Columbian College of Arts and Sciences fr
two-year colleges, in which case no more than 60 or 66 semester hours
credit may be assigned, respectively, there is no strict limit to the to
amount of credit that may be assigned. However, a student must satisfy t
residence and course requirements for the degree sought at George Was
ington University.

CREDIT BY EXAMINATION

Assuming there is no duplication of course work, a maximum of
semester hours of credit may be assigned upon admission to the Univers
for each or any combination of the following except as noted:

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT TESTS (APT)

Credit is assigned for examinations passed with scores of four or five
the basis of a score report sent to the Office of Admissions from the Ed
cational Testing Service at the student's request. Examinations passed wi
scores of three will be considered for credit or placement if the stude
arranges to have the examination paper sent to the Office of Admissio
The Advanced Placement Tests are administered in the seconda
school in May of each year. Normally only students who complete
course designated as Advanced Placement are prepared for the examin
tion. Arrangements for the examination are the responsibility of the a
plicant and should be made through the secondary school attended
with the Program Director, College Entrance Examination Board, A
vanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 102
Berkeley, Calif. 94701.

COLLEGE ENTRANCE EXAMINATION BOARD COLLEGE-LEVEL EXAMINATION PROGRAM (CLEP)

CLEP offers two types of examinations: General and Subject Examin
tions. CLEP General Examinations are offered in five areas: mathemati
social sciences, humanities, natural sciences, and English compositi

LEP Subject Examinations measure achievement in specific college-level urses and are offered in more than 20 subjects.

Upon admission to a program leading toward a degree, credit is signed for the General Examinations, with the exception of the English mposition examination and the mathematics examination.* To receive edit, examinations must be passed at the 50th percentile or above 963/1972 college sophomore norms). Credit is assigned, with a few ceptions, for the Subject Examinations passed at the level recommended the College Board model policy.* A candidate for a degree who is gistered at this University must seek departmental and dean's approval ior to taking the examination to receive credit for a CLEP Subject xamination. Credit may not be earned by passing the examination after aving taken the equivalent course. Arrangements for the examinations e the responsibility of the applicant and should be made with the ollege Entrance Examination Board College-Level Examination Pro-am, Box 1824, Princeton, N.J. 08540.

PECIAL DEPARTMENTAL EXAMINATIONS FOR UNDERGRADUATES

xcept for students admitted to the School of Government and Business dministration, credit may be assigned for Special Departmental Exami-ations, see page 77.

REDIT EARNED THROUGH UNITED STATES ARMED FORCES INSTITUTE (USAFI)

xcept for students enrolled in the School of Government and Business dministration, credit is assigned for approved United States Armed orces Institute college-level examinations passed with satisfactory scores.

REDIT FROM SERVICE SCHOOLS

xcept for undergraduates admitted to the School of Government and usiness Administration, a limited amount of credit may be assigned for elected service school instruction received since 1941. Veterans should ubmit to the Office of Admissions photostatic copies of their service chool records, indicating courses successfully completed with sufficient dentification of the course to locate it in the *Guide to Evaluation of Edu-ational Experience in the Armed Forces*.

REDIT FOR COURSES OFFERED BY NONCOLLEGIATE ORGANIZATIONS

xcept for undergraduates admitted to the School of Government and usiness Administration, a limited amount of credit may be assigned for elected courses offered by noncollegiate organizations. The University ssigns some of the credit listed in the *National Guide to Credit Rec-mmended for Noncollegiate Courses*. Students who wish to know if ourses offered by their employers can be considered for credit should

*See page 142 for additional qualifications for applicants to the School of Government and usiness Administration.

inquire at the Office of Admissions. Courses containing fewer than hours of class instruction are not reviewed. Records, which vary w the sponsoring organization, will be required.

ADVANCED PLACEMENT

Advanced placement or waiver of a requirement will be granted on basis of scores on Achievement Tests of the College Entrance Exami tion Board as follows:

Achievement Test	Minimum Score	Exemption
English Composition	650	Waives Engl 10
English Composition	680	Waives Engl 11 or 12
European and/or American History	600	Waives Hist 39-40 and/or 71-72
French	650	Waives a two-year langu requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

GRADUATE ADMISSION*

Graduate School of Arts and Sciences—Forms for application for mission or readmission are available at the Office of the Dean of Graduate School of Arts and Sciences, George Washington Univers Washington, D.C. 20052. Completed applications and requests for fello ship support must be submitted by February 15 (February 1 for stude in clinical psychology and art therapy) for admission in the fall semes and by November 1 for the spring semester. Applications for gradu study are acceptable after these dates for admission in the correspond semester and will be reviewed if time permits and if space is available the program desired.

School of Education and Human Development—Forms for applicat for admission or readmission are available at the Office of the Dean of School of Education and Human Development, George Washington U versity, Washington, D.C. 20052. When completed, these application for should be submitted to this Office no later than June 1 for the fall semes November 1 for the spring semester and April 1 for the summer sessio unless an extension is granted by the office of the dean.

School of Government and Business Administration—Forms for ap cation for admission or readmission are available at the Graduate Adm sion Office, School of Government and Business Administration, Geo Washington University, Washington, D.C. 20052. The Application Graduate Degree Candidacy shows the application deadlines for the grees offered by this school.

School of Public and International Affairs—Forms for application

* For detailed admission requirements, see the appropriate college or school in this Bulle See pages 25-28 for admission requirements for students from foreign institutions.

admission or readmission are available at the Graduate Admissions Office, School of Public and International Affairs, George Washington University, Washington, D.C. 20052. When completed, these application forms should be submitted to this Office no later than March 1 (February 1 for applicants for graduate fellowships or assistantships and foreign applicants). Admission is for the fall semester only. All credentials, including transcripts from all institutions attended, Graduate Record Examination scores and letters of reference, must be received before the deadline date.

DIVISION OF UNIVERSITY AND SUMMER STUDENTS ADMISSION

Forms for application for admission to *nondegree* status in the Division of University and Summer Students are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052. When completed, these application forms, with credentials when required, should be received by the Office of Admissions no later than the Friday before the first day of registration (see Calendar, pages 5-7). To avoid paying a late registration fee, every effort should be made to insure that any required credential is in the Office of Admissions prior to registration. No fee is charged for application for admission to this Division. For detailed entrance requirements, see page 183.

Registration in a given course may be denied students in this Division when space is needed for degree candidates.

READMISSION

Students previously registered in the University who were not registered on campus during the immediately preceding semester (summer session excluded), must apply for readmission. Final dates for applying are the same as those for "Undergraduate Admission" (see pages 20-21), or "Graduate Admission" (see pages 24-25). Students who apply as degree candidates and who were previously registered as nondegree students, or who attended one or more institutions of higher learning during absence from the University, must have complete official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations in effect at the time of readmission.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of last registration at this University and who have not since registered at another institution.

STUDENTS FROM FOREIGN INSTITUTIONS*

Application, required records, and scores on the *Test of English as a Foreign Language* (see page 26) should be received from international students no later than March 1 (February 1 for applicants for graduate study in the School of Public and International Affairs) for the fall semester and October 1 for the spring semester.

* For detailed admission requirements, see the appropriate college or school in this *Bulletin*.

George Washington University offers an English-language program fo foreign students.

Required Records

At the time the application is sent, students must request the educationa institution previously attended to send directly to the appropriate ad missions office (see "Undergraduate Admission," pages 20-21, or "Graduat Admission," pages 24-25) copies of official certificates and records listin subjects studied, grades received, examinations taken and degrees re ceived. Certified copies of diplomas and certificates from all secondar schools, colleges, and universities attended are required. Records o state examinations and certificates are also required. These records be come the property of the University and cannot be returned.

These documents should be in the language in which the institutio keeps its official records. If they are in a language other than English the copies which are sent should be accompanied by an English translation

Language Tests

Students whose native tongue is not English should take the *Test o English as a Foreign Language* (TOEFL) and have the scores submitte to the appropriate admissions office. Those students seeking admissio to the School of Government and Business Administration must subm a TOEFL score. Students are responsible for making arrangements for tak ing the test by addressing inquiries to TOEFL, Educational Testing Servic Princeton, N.J. 08540, U.S.A., well in advance of the beginning of the se mester for which admission is sought. The test fee remitted with the ap plication entitles the student to have the test score sent to three differen institutions. Registration for the *Test of English as a Foreign Languag* does not constitute application for admission to George Washingto University.

The *Bulletin of Information*, obtainable without charge, contains a de scription of the test as well as rules regarding application, fees, reports and the conduct of the test; lists of examination centers; examination dates and an application blank. On the application for the test, the studen should specify that the scores be sent to the appropriate admissions offic at this University (see "Undergraduate Admission," pages 20-21, o "Graduate Admission," pages 24-25).

In addition to the TOEFL, an admitted student is required to tak a test in English as a second language prior to registration. Results o this test will determine the courses the student will be permitted to registe for in the program of study. If the knowledge of English is inadequat to enable the student to undertake any academic work, the student wil not be permitted to register for any courses other than English and wil be required to study English on a full-time basis.

Financial Certificate

If a student plans to enter or remain in the United States to study at thi University and the visa status will be either student (F) or exchang visitor (J), a Form I-20 or DSP-66 cannot be issued until the student ha

een admitted to the University and has completed the Financial Certifi-ate to our satisfaction.

TRANSFER WITHIN THE UNIVERSITY

For information concerning transfer from one college, school, or division to another within the University, see page 47.

REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register. Registration in a given course may be denied students in the Division of University and Summer Students when space is needed for degree candidates.

New Student—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the University who was not registered on campus during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before he or she is eligible for registration.

Continuing Student—The student registered on campus in the immediately preceding semester or the summer session preceding the fall semester is eligible to register assuming good standing and enrollment in a continuing program.

Registration Changes and Withdrawals (See pages 46-47)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other in stitutions in the Consortium of Universities of the Washington Metropolita Area, Inc. (see page 53), should consult the program announcements the other institutions. Consortium registration forms and instructions ma be picked up in the Office of the Registrar after obtaining registratio materials. In order to participate in the Consortium program, students mus obtain the approval of an advisor and should ascertain from the depart ment of the institution where the course is taught whether they are eligibl for the course and whether there is space in the class. Specific inquiri should be addressed to the Registrar.

FEES AND FINANCIAL REGULATIONS

Fees paid by students cover only a portion of the cost of the operatio of the University. Income from endowment funds, grants, and gifts fro alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 198 summer sessions and the academic year 1980-81. (See page 30 for pr jected tuition increases for 1981-84.)

Tuition Fees

For undergraduate study in Columbian College of Arts and Sciences, the Scho of Education and Human Development, the School of Government and Busine Administration, the School of Public and International Affairs; and for cours taken on campus by undergraduate students in the College of General Studi

Full-time program (12 or more semester hours), each semester	$1,700.0
Part-time program, for each semester hour	125.0
Summer Sessions, for each semester hour	117.0

For graduate study* in the Graduate School of Arts and Sciences, the School Education and Human Development, the School of Government and Busine Administration,† and the School of Public and International Affairs; for grad ate and undergraduate courses taken through the Division of University a Summer Students; and for courses taken on campus by graduate students the College of General Studies:

For each semester hour for which a student registers	$125.0

* Payment of tuition for a master's thesis entitles the candidate, during the period of registr tion, to the advice and direction of the member of the faculty under whom the thesis is to b written. In case a thesis is unfinished, additional semester hours may be required in accordan with the regulations of the school in which the student is registered

† Students entering doctoral programs in the School of Government and Business Administrati in 1980-81 will be charged $9,600 for the entire degree program, to be paid in 10 semiannual in stallments. Contact the School's Doctoral Programs Office

niversity Center Fee (charged all students registered on campus)

or students registered for 11 or more semester hours on campus:

Each semester 50.50

or students registered for less than 11 semester hours on campus:

For each semester hour for which the student registers 4.75

nergy Surcharge—Because the price of fuel oil has risen out of proportion the projected increase of tuition fees, and because this price is anticipated rise even further in 1980-81 by an indeterminate amount, an energy surharge will be assessed at the time of registration. The amount of this surharge will be determined and announced prior to July 1, 1980.

dditional Course Fees

n certain courses additional fees, such as laboratory and material fees, are harged as indicated in the course descriptions. These fees are charged by the emester and, unless otherwise indicated, may be defrayed in two payments hen the tuition is paid in this manner. If breakage of apparatus is in excess f the normal amount provided for in the laboratory fee, the individual student ill be required to pay such additional charges as are determined by the deartment concerned.

Graduation Fees

Associate in Arts	$10.00
All other degrees offered by the University	25.00
Fee for binding master's thesis	15.00
Fee for microfilm service and printing announcement of final examination (doctoral candidates)	65.00

Residence Hall Fees (see pages 59-60)

Special Fees and Deposits

Application fee (undergraduate degree candidate), nonrefundable...	15.00
Application fee (graduate degree candidate), nonrefundable	25.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space	100.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period	15.00
Late-payment fee (see Payment of Fees, page 31)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, page 31)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
For each waiver examination to qualify for advanced placement	5.00

English test for international students (when required)	10
Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor*	10
Transcript fee, for each transcript of record	2
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	1
Replacement of lost or stolen picture identification card	2

Registration for on-campus courses in the University entitles each stude to the following University privileges: (1) the services of the Stude and Alumni Career Services Office; (2) the use of the University Librar (3) gymnasium privileges; (4) admission to all athletic contests, unle otherwise specified; (5) subscription to the *University Hatchet*, the stude newspaper; (6) admission to University debates; (7) medical attention described under Student Health Service. These privileges terminate wh the student withdraws or is dismissed from the University.

Postdoctoral Study

George Washington University doctoral graduates may continue any studi in the University without payment of tuition, and enjoy all Universi library privileges. Such graduates are required to pay a nominal f based on the prevailing credit hour rate for one semester hour, as well as the University Center fee, in order to establish their active mem bership in the University. The use of laboratory space and equipme is contingent upon availability, and the cost of all laboratory or spec library material is paid by the graduate. Special arrangements for su privileges must be made with the dean two months in advance the semester in which the graduate wishes to register. Postdoctoral wo taken under this privilege may not be applied toward any degree offer by the University.

Projected Tuition and Fee Increases 1981-84

In order that students and their parents may plan more realistically for total four-year period, tuition increases for the academic years 1981-8 1982-83, and 1983-84 have been estimated as follows:

Increase by year (full-time undergraduate students):

1981-82	$300
1982-83	400
1983-84	400

Increase by semester hour (graduate and part-time undergraduate students):

1981-82	1
1982-83	1
1983-84	1

It is not possible to project future economic data with certainty. Th increases outlined above are merely estimates based on present circu stances and should in no way be interpreted as fixed limits on tuiti

* A student who drops a chemistry course before the end of the semester must check out of laboratory at the next laboratory period

increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $750.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Returned check—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid within 15 days, the student will forfeit all rights to check cashing at the University, and future payments for tuition, dormitory, food service, and other special fees will require payment by cash, certified check, or money order.

Prepaid and Deferred Payment Plans

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide

a life insurance policy in the contract. For specific details and application address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, P 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenu Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain supply of applications for these various programs, but will be happy provide guidance to students and parents.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in cla schedule must be made in person or in writing to the dean of the colleg school, or division in which the student is registered. Notification to instructor is not an acceptable notice (see "Withdrawal," page 46).

In authorized withdrawals and changes in schedule, cancellations semester tuition charges and fees will be made in accordance with th following schedule for the fall and spring semesters:

1. *Complete withdrawal from the University:*

Withdrawal dated on or before Saturday of the first week of classes..	90
Withdrawal dated on or before Saturday of the third week of classes.	75
Withdrawal dated on or before Saturday of the fifth week of classes..	50
Withdrawal dated after the fifth week of classes	No

2. For a *change in status from full-time to part-time student* or for *parti withdrawal by a part-time student*, the above schedule applies to th difference between charges for the original program and the adjuste charges for the revised program.
3. A student enrolled in an undergraduate full-time program who drop or adds a course and continues to be in a full-time program will have n financial adjustments of tuition made other than those involving cour fees.
4. Regulations governing student withdrawals as they relate to residenc hall and food service charges are contained in the specific lease arrang ments.

Refund policies of the University are in conformity with guidelines fo refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence fro classes.

Authorization to withdraw and certification for work done will not b given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until the can make banking arrangements in the community.

* Regulations concerning withdrawal and refunds for the summer sessions are stated in *Summer Sessions Schedule*.

FINANCIAL AID

FOR UNDERGRADUATE STUDENTS*

George Washington University offers a program of financial assistance of two basic types: awards for academic achievement without reference to financial circumstances—honor scholarships; and scholarships, grants, loans, and employment based upon demonstrated financial need.

Honor Scholarships—George Washington University honor scholarships of up to half-tuition for the academic year, based entirely upon academic achievement and potential without regard to financial need, are restricted to incoming freshmen and are extremely limited in number.

Need-based Aid—The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the National Direct Student Loan, Basic Educational Opportunity Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed by February 1 (entering freshmen) or March 3 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 3 for the spring semester; and by April 1 for the summer sessions.† A student must reapply for financial aid each year.

Complete information concerning financial assistance is contained in the student financial aid pamphlet, which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

The following scholarships are available to students in Columbian College of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

The George Washington University Board of Trustees Scholarships—Full- and partial-tuition scholarships, which begin in the fall semester and extend for four successive academic years, provided the holder maintains a B average and continues to be in financial need. Candidates must plan to select a curriculum leading to a bachelor's degree in any school listed above. Students who have demonstrated outstanding ability in interscholastic speech and debate activities are eligible for the George F. Henigan Scholarships in Debate which are included among these scholarships.

Other Scholarships

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship
Sherman Page Allen Memorial Scholarship Fund (1966)
Alumni Scholarships

* For information concerning financial aid for students from foreign countries, see pages 38-39.
† Only students who are enrolled in this University for at least eight semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for Summer Sessions financial aid.

Mary J. Anderson Scholarship (1969)
Athletic Scholarship Fund (1979)
Bache and Company Scholarships
Byron Andrews Scholarship (1920)
Henry N. Brawner, Jr., Foundation Scholarship Fund (1963)
Emma K. Carr Scholarships (1932)
Maria M. Carter Scholarship (1871)
Paul E. Casassa Memorial Foundation Scholarship (1968)
The Chesapeake and Potomac Telephone Company Scholarship (1978)
Columbian Women Scholarship Funds
- Victoria Briggs Scholarship Fund (1959)
- Elizabeth V. Brown Scholarship Fund (1925)
- Grace Ross Chamberlin Scholarship Fund (1932)
- College Women's Scholarship Fund (1926)
- Columbian Women Members' Scholarship Fund (1961)
- Arline Hughes Dufour Scholarship Fund (1961)
- Dr. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fun (1964)
- Founders of Columbian Women Scholarship Fund (1920)
- Rose Lees Hardy Foundation Scholarship Fund (1957)
- Lillian Young Herron Scholarship Fund (1925)
- Nellie Maynard Knapp Scholarship Fund (1915)
- Marcia B. Kraft Scholarship Fund (1966)
- Janet McWilliams Scholarship Fund (1954)
- Marie-Louise Ralph Turner Scholarship Fund (1963)

D.C. Daughters of the American Revolution Scholarship (1952)
Isaac Davis Scholarship (1869)
District of Columbia Institute of Certified Public Accountants Scholarshi in Accounting (1964)
Estella Constance Drane Scholarship (1957)
Robert Farnham Scholarship (1871)
Federal Government Accountants Association—Washington, D.C., Chapte —Scholarship in Accounting
Esther Brigham Fisher Scholarship (1951)
George Washington University Tennis Alumni Association Scholarshi (1974)
Mildred Green Memorial Scholarship Fund (1959)
Gridiron Foundation of the Gridiron Club Scholarship (1975)
Isadore and Bertha Gudelsky Family Scholarship (1978)
Anna Spicker Hampel Scholarship (1949)
Julian O. Hargrove Scholarship (1968)
Elma Lewis Harvey Scholarship (1921)
Hazleton Scholarship (1950)
George F. Henigan Scholarships in Debate (1967)
International Student Scholarships (see pages 38-39)
David B. and James L. Karrick, Jr., Scholarship Fund (1968)
Samuel and Elizabeth Kay Scholarships (1969)
Amos Kendall Scholarship (1869)
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)
Mary and Daniel Loughran Scholarship (1976)
Martha's Marathon Residence Hall Scholarship (1969)

Maud E. McPherson Scholarship in English and English Literature (1978)
A. Morehouse Scholarship (1861)
S. K. Morris Education Fund Scholarships (1972)
Helen Marie and Thomas E. Orr Scholarships (1965)
Hardy Pearce Scholarship Fund (1972)
Phi Delta Gamma Scholarships (1956)
Fred B. and Alma D. Pletcher Scholarship Fund (1968)
Levin M. Powell Scholarships (1886)
Research Assistantships in Operations Research and Related Fields (see page 36)
Resident Assistantships (see page 36)
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)
U.S. Office of Education Traineeships (1964)
University Players Scholarship in Memory of L. Poe Leggette (1968)
William Walker Scholarship (1824)
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)
John Withington Scholarship (1830)
Women's Physical Education Alumnae Association Scholarship (1964)
William G. Woodford Scholarship (1969)
Ellen Woodhull Scholarship (1919)
Zonta Club Scholarship (1950)

Grants

The following funds have been established to meet the special needs of disadvantaged students from the District of Columbia Inner-City and the Washington metropolitan area.

George Washington University's Educational Opportunity Program Tuition Grants (1968)
Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
Marriott Foundation Grant (1968)

FOR GRADUATE STUDENTS*

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the dean of the school concerned, and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted no later than February 1 preceding the academic year for which the award is made.

* For information concerning financial aid for students from foreign countries, see pages 38-39

Assistantships

Research Assistantships in Operations Research and Related Fields Available to graduates, and to undergraduates on the junior and seni levels, in any school of the University. Research assistants are expect to work 20 hours a week conducting research in support of an establish research program, in programming or in conducting individual research an approved research project. Stipends range up to $8,000, depending the status of the student and the tenure of the appointment (9–12 month Further information and applications are available from Director, Institu for Management Science and Engineering, School of Engineering and A plied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate st dents and seniors in any field of study who are interested in working wi the student personnel program in University residence halls. Specific duti vary with the position, but basically consist of counseling, advising stude groups, and administration. Remuneration includes partial tuition and furnished room for the academic year. All positions are part-time, a staff members are required to enroll as full-time students in degree gra ing programs. Further information may be obtained from the Office the Director of Housing.

Health Services Administration Research Assistantships
National League of Cities/George Washington University Assistantship
Urban Affairs Assistantship

Fellowships, Internships, Traineeships, Special Programs

The following fellowships, internships, and traineeships are available students in the Graduate School of Arts and Sciences, the School of Educ tion and Human Development, the School of Government and Business A ministration, and the School of Public and International Affairs. The Un versity also offers many other fellowships which are available to studen in these colleges and schools.

University Fellowships—Available to graduate students in master's a doctoral programs in most departments of the University. Fellowships a based on scholarship and each fellow may receive a stipend, tuition allo ance, and course fees.

Graduate Teaching Assistantships—Available to graduate students master's and doctoral programs in most departments of the University. graduate teaching assistant receives financial compensation for a desi nated unit of service to the assistant's major department of instruction.

Research Traineeships—Available under numerous sponsored progra in a number of departments. Currently, the basic medical science depa ments and the Departments of Psychology and Speech and Drama off such programs. Stipends vary; information is available from the depa ments and the Office of the Dean of the Graduate School of Arts a Sciences.

Achievement Rewards for College Scientists (ARCS) Foundation, In Fellowship
Robert A. Aleshire Fellowship Fund (1971)
American Association of Collegiate Schools of Business Fellowship

American Civilization Fellowships
American Civilization Internships (Smithsonian Institution-George Washington University Cooperative Program)
American Iron and Steel Institute Fellowship
Arthur Anderson & Co. Doctoral Fellowship
Aryamehr Research Fellowships
Winfield Scott Blaney Fellowship in International Affairs (1961)
Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning (1973)
Thomas Alva Edison Fellowship
Elementary Teacher Education Internships
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics
Health Care Administration Fellowships
International Student Fellowships (see pages 38-39)
Richard D. Irwin Doctoral Fellowships
Isabella Osborn King Research Fellowships (1927)
Loula D. Lasker Fellowships in Housing, City Planning, or Urban Renewal
Mary and Daniel Loughran Graduate Scholarship (1976)
Mellon Foundation Fellowships
Minorities in Planning and Related Professions Program
National Association of Purchasing Management Fellowship
National Historical Publications Commission-George Washington University Cooperative Research Fellowships
National Science Foundation Graduate Fellowships
Resources for the Future, Inc., Fellowship Prize
Rose Bibliography Internships
Thomas Bradford Sanders Fellowships (1928)
Scottish Rite Foundation Fellowships
U.S. Office of Education Fellowships (1964)
U.S. Public Health Service Traineeships
U.S. Public Health Service Traineeships in Comprehensive Health Planning
Urban Studies Fellowships of the Department of Housing and Urban Development
Urban Transportation Center Fellowship

Graduate Scholarships

Armed Forces Health Professions Scholarship Program (The Uniformed Services Health Professions Revitalization Act of 1972—Public Law 92-426)
Barbee Sculptor Scholarship (1975)
Emma K. Carr Scholarships (1932)
District of Columbia Institute of Certified Public Accountants Scholarship in Accounting (1964)
Genetics Graduate Scholarship (1979)
Myron L. Lee Scholarship Fund (1975)
Mary and Daniel Loughran Graduate Scholarship (1976)
Foster G. McGaw Scholarship in Health Care Administration (1971)
Paul Pearson Scholarship Fund (1940)
Phi Delta Gamma Scholarship Fund (1968)
Voorhees Scholarships
Wolcott Foundation Scholarships

Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional learned societies, industries, and others which may be used in suppor graduate study is available at the Graduate Fellowship Information C ter, 2025 H St., N.W., for students enrolled at George Washing University. Information is also available on distinguished programs such the Rhodes, Marshall, National Science Foundation, Fulbright, and Rot International, as well as many others.

As deadlines for application vary, qualified students should make quiries well in advance of the year of planned graduate study.

LOAN FUNDS

The following loan funds are available to undergraduate and/or gradu students in Columbian College of Arts and Sciences, the Graduate Sch of Arts and Sciences, the School of Education and Human Developm the School of Government and Business Administration, and the Sch of Public and International Affairs. A separate application must be s mitted for all loan programs. Applications for the National Direct Stud Loan should be filed no later than April 1 for the following academic y Complete information is contained in the pamphlet "Student Finan Aid," which is available in the Office of Student Financial Aid, Geo Washington University, Washington, D.C. 20052.

American Medical Association Nursing Home Administration Loan Fund
George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
W. K. Kellogg Foundation Hospital Administration Loan Fund
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
Ellis H. Stearman Emergency Loan Fund
Hiram Miller Stout Memorial Loan Fund (1973)
University Student Emergency Loan Fund

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquir should be addressed to the Office of Student Financial Aid. In addition, Student and Alumni Career Services Office maintains a registry of b full-time and part-time positions available in the Washington area undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Car Services Office, Woodhull House, 2033 G Street, N.W., for interviews a referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who ha completed one semester of full-time work (15 hours) at this Univers

with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, page 3.

Limited awards for graduate teaching assistantships and University Fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

We suggest that students who wish to study in the United States have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is approximately $7,000. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

LAW ENFORCEMENT EDUCATION PROGRAM

This program of grants and loans, authorized under the provisions of the Omnibus Crime Control and Safe Streets Act of 1968, is intended to help pay the cost of educational expenses for employees of state and local criminal justice agencies. Studies may be full- or part-time in a wide range of subject areas and degree goals. Applications and further information are available from the LEEP Coordinator, Graduate School of Arts and Sciences.

PRIZES

Accounting Prizes—Three prizes for academic excellence awarded annually by the Department of Accounting—two at the undergraduate level and one at the graduate level.

Alpha Chi Sigma Prize—Awarded annually by the Alpha Pi Chapter to the student who has attained the highest academic record in courses in chemistry. The name and year of graduation of the student is inscribed on a bronze plaque. The winner must have had at least 16 hours in chemistry, including the final semester at this University.

American Chemical Society Prize—Awarded to an undergraduate student who has completed the junior year and who has demonstrated excellence in analytic chemistry.

American Institute of Chemists Prize—A medal awarded annually to the

graduating student majoring in chemistry who excels in scholarship, tegrity, and leadership.

Department of Art Prizes—Two prizes—one for an undergraduate maj ing in Art History and one for an undergraduate majoring in Fine Arts awarded annually to the most promising students, as determined by t departmental faculty.

The Walter G. Bryte, Jr., Achievement Award—Provided by Walter Bryte, Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science George Washington University. The award is presented annually primar to that undergraduate residence hall, secondarily to any other activity the University, which has shown under the leadership of its elected designated head, the most improvement or excellence in its support of t principles and aims of the United States of America and George Wa ington University. The hall or other activity will be awarded a cash pri and the name of its leader and the hall or activity will be engraved on silver trophy.

Byrne Thurtell Burns Memorial Prize—Awarded to the senior majoring chemistry who shows the greatest proficiency in organic chemistry, as e denced by a comprehensive examination, and who possesses such qualifi tions of mind, character, and personality as to give promise of futu achievement.

Business Administration Prize—Awarded annually by the Department Business Administration to the outstanding graduating senior in busine administration on the basis of scholarship, leadership and service to t University.

Wilbur J. Carr Prize—Established in 1962 by Edith K. Carr, former Tru tee of the University, in memory of her distinguished husband, who w graduated from the School of Comparative Jurisprudence and Diploma in 1899. It is awarded annually to that student in the graduating class the University who has demonstrated outstanding ability in the study international affairs and who has given evidence of possessing in mark degree the qualities which produce the good citizen and the dedicat public servant.

Chemical Rubber Company Freshman Chemis. , Achievement Prize *A Handbook of Chemistry and Physics* awarded annually to the freshm student who has demonstrated the greatest achievement in Chemistry 15-

Chemical Society of Washington Prize—Awarded to an outstandi undergraduate in the junior year who is majoring in Chemistry.

John Henry Cowles Prizes—Two prizes, established by John H. Cowl Grand Commander of the Supreme Council of Thirty-third Degree (Moth Council of the World) of the Ancient and Accepted Scottish Rite of Fre masonry, Southern Jurisdiction of the United States of America. Award annually to the senior in the School of Government and Business A ministration and to the senior in the School of Public and Internation Affairs with the highest academic averages.

DeWitt Clinton Croissant Prize—Awarded annually to the undergradua student enrolled in a course in drama or active in University dramatics w submits to the English Department the best essay on drama or the thea

E.K. Cutter Prize—Established by Marion Kendall Cutter "for excelle in the study of English." Awarded to the member of the graduating cl

se record in English, combined with general excellence, shows most ked aptitude for and attainment in English studies.

ac Davis Prizes—Established in 1847 and awarded annually to the e seniors who have made the greatest progress in public speaking while lled in the University. Awards are to be determined by a public- king contest in which the participants deliver original orations. Only bers of the senior class of Columbian College of Arts and Sciences are candidates for the degree of Bachelor of Arts or Bachelor of nce are eligible to compete.

enry Grattan Doyle Memorial Prize—Established in memory of Henry tan Doyle, a former Dean of Columbian College. Awarded annually to utstanding senior for excellence in Spanish.

ton Prize—Established by the Reverend Romeo Elton, of Exeter, Eng- , and awarded annually to the student with the highest average in the t advanced course in the Greek language and literature.

sse Frederick Essary Prize in Journalism—Established by Helen Essary phy and awarded annually to a student who has given promise of d citizenship and who submits the best printed and published evidence bility in "forthright reporting" and good journalistic writing, in a stu- publication or elsewhere.

shua Evans III Prize in Political and Social Science—A memorial prize ablished by friends because of an outstanding life." Awarded an- ly to that student in the graduating class "who has demonstrated his/ signal ability in the social and political sciences and who has given nise of the interpretation of that ability in good citizenship among his/ fellows."

illie E. Fitch Prize—Established by James E. Fitch in memory of his Awarded annually to a senior student for the best examination in nistry.

harles E. Gauss Prize—Established in honor of Charles E. Gauss, n Professor of Philosophy from 1945 to 1964. Awarded annually to a luating senior for excellence in philosophy.

lice Douglas Goddard Prize—A memorial established by Frederick ph Goddard, of Georgetown, D.C. Awarded annually to the senior lent making the highest average in American literature.

dward Carrington Goddard Prize—Established by Mary Williamson ddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of rgetown, D.C., in memory of Edward Carrington Goddard, class of . Awarded to the junior or senior student making the highest average he French language and literature.

lorgan Richardson Goddard Prize—A memorial established by Mary liamson Goddard, Alice Douglas Goddard, and Frederick Joseph God- d, of Georgetown, D.C. Awarded to the junior or senior student making highest average in the following fields: business administration, eco- nics, international business, or public accounting.

ardiner G. Hubbard Memorial Prize in United States History—Estab- ed by Gertrude M. Hubbard in memory of her husband and awarded ually to that member of the graduating class majoring in history who maintained the highest standing in courses in United States history.

nternational Business Prize—Two prizes awarded annually by the

School of Government and Business Administration to students sp
ing in international business, one awarded to a graduating senior a
awarded to a graduate student.

David Lloyd Kreeger Prizes in Art—Five prizes given by Mr. K
three in the fine arts and two in art history (including museology)
arts prizes are awarded to a senior or graduate student in painting,
ture, and graphics or design. One prize in art history is awarde
senior and one to a graduate student. Candidates for the prizes mu
mit original papers or works of art. Winners are selected by disting
representatives of the field of art in the Washington, D.C., area.

Minna Mirin Kullback Memorial Prize—Established in 1968 by So
Kullback in memory of his wife. Awarded annually by a commit
faculty members of the Department of Statistics to a full-time
graduate or graduate student majoring in statistics, who will have
pleted 18 semester hours of statistics courses by the end of the
semester.

John Francis Latimer Prize in Classics—Established in 1973. Aw
to a graduating senior who has made the most outstanding record
major in the Department of Classics.

Hilda Haves Manchester Prize in Sociology—Established in ho
Hilda Haves Manchester, B.A. 1932, an outstanding student whose
field was sociology. Awarded annually by Columbian College o
and Sciences to the senior student majoring in sociology who h
highest scholastic record.

Vivian Nellis Memorial Prize—Awarded to a student in the Engli
partment who has shown special promise in the field of creative writ

Phi Delta Kappa Prize—Awarded annually by the George Wash
University Chapter to an outstanding senior in a teacher educatio
gram in the School of Education and Human Development.

Phi Delta Kappa Research Prize—Awarded annually by the G
Washington University Chapter to a graduate student, for an outst
research project.

Phi Eta Sigma Prize—A choice book selected from the field of t
cipient's major, awarded annually by the George Washington Univ
Chapter to the student attaining the highest scholastic average in th
full semester of work. The winner's name is engraved on a plaque i
Office of the Dean of Columbian College of Arts and Sciences.

Pi Lambda Theta Prize—Awarded annually by Alpha Theta Chap
an outstanding senior in a teacher education program in the Scho
Education and Human Development.

Psi Chi Prizes—Two prizes awarded annually by the George Washi
University Chapter to the best undergraduate student in experimental
chology and to the M.A. degree candidate or second-year graduate st
submitting the best thesis or research project in psychology.

Ruggles Prize—Established by Professor William Ruggles in
awarded annually to a candidate for a bachelor's degree for excelle
mathematics.

The Jack and Anne Ryan Award in Health Services Administrat
Awarded annually to that Health Services Administration student wh
plays excellence of analysis and writing skills in the preparation
paper on a topic in health services administration.

ermann and Johanna Richter Schoenfeld Prize—Established in grateful
eciation of the inspired teaching and devotion to his students of Dr.
mann Schoenfeld, who for more than 20 years until his death in 1926
ded the Department of German. Hermann Schoenfeld, Ph.D., LL.D.,
widely recognized as a scholar of distinction whose presence on the
lty added prestige to the University. This prize is given annually to a
nber of the graduating class for excellence in historical and cultural
ses of German studies.

ociety of Colonial Wars in the District of Columbia Prize—A cash
e awarded to a candidate for a graduate degree who, in the judgment
he faculty of the Department of History, submits a thesis or disserta-
demonstrating excellence in historical research in American Colonial
ory. The University reserves the right to withhold the award if no
is or dissertation attaining the required degree of excellence is sub-
ted.

taughton Prize—Established by the Reverend Romeo Elton and awarded
ually to the student making the best record in the most advanced
rses in the Latin language and literature.

mes MacBride Sterrett, Jr., Prize—Established in 1911 by Professor
rett in memory of his son. Awarded annually to the student who ob-
s the highest average in Physics 1 and 2.

harles Clinton Swisher Historical Club Prize—Established in 1936 by
Charles Clinton Swisher Historical Club and augmented in 1941 by the
uest of Professor Swisher. Awarded annually to the student who sub-
s the best essay covering some phase of medieval history.

mes H. Taylor Graduate Mathematics Prize—Established in memory of
es H. Taylor, former Professor of Mathematics at the University.
arded annually to a graduate student for outstanding performance in
hematics.

atricia M. Toel Memorial Prize—Awarded to a graduate student in
tography to recognize outstanding achievement.

enjamin D. Van Evera Memorial Prize—Awarded annually to that
duate Teaching Fellow in Chemistry selected as the most effective
cher during the current academic year.

homas F. Walsh Prize—Established in 1901 and awarded annually to
student who submits the best essay in Irish history.

he Washington Society of Investment Analysts Award—A $500 award
en to a full-time candidate for the Master of Business Administration
ree who is interested in finance and investments, has a high under-
duate academic record, and demonstrates financial need.

lexander Wilbourne Weddell Prize—Established in 1923 by Virginia
se Weddell in memory of her husband. Awarded annually to a degree
didate who writes the best essay on "the promotion of peace among
nations of the world." The prize essays shall become the property of
University and shall not be printed or published without the written
sent of the University. The University reserves the right to withhold
award if no essay attaining the required degree of excellence is
mitted.

Vomen's Transportation Seminar Prize—Awarded annually by the
men's Transportation Seminar to an outstanding student specializing
ransportation in the School of Government and Business Administration.

REGULATIONS

Students enrolled in the University are required to conform to the f ing regulations and to comply with the rules and regulations of the c school, or division in which registered.

Students who withdraw or are suspended, or who, for any other r are not registered at the University for one semester or more, may re and continue work only under the regulations and requirements in at the time of return.

If a student knowingly makes a false statement or conceals ma information on an application for admission, registration card, or any University document, the student's registration may be canceled. If falsification is discovered after the student has established an aca record at the University, the student may be subject to dismissal the University. Such a student will be ineligible (except by special of the Faculty) for subsequent registration in the University.

ATTENDANCE

Students may not attend classes until registration is completed and due are paid. They may attend only those classes for which the registered. Regular attendance is expected. Students may be dropped any course for undue absence.

SCHOLARSHIP REQUIREMENTS

Students who fail to maintain the scholarship requirements of the c school, or division in which registered may be dismissed from the versity.

Grades

Grades are mailed to students through the Office of the Registrar close of each semester. They are not given out by instructors.

UNDERGRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Sat tory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized drawal; *Z*, Failure, Unauthorized Withdrawal; *P*, Pass; *NP*, No Except for courses which specifically state that repetition for cr permitted, a candidate for a degree at this University may not repe credit a course in which a grade of *D* or better was received, unle quired to do so by the department concerned. A written statem this effect must be submitted to the Registrar by the appropriate d ment chairman.

DUATE

following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum ; *CR*, Credit; *F*, Fail; *I*, Incomplete; *IP*, Progress; *P*, Pass; *NP*, No Pass; Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. Except courses which specifically state that repetition for credit is permitted, a didate for a degree at this University may not repeat for credit a course hich a grade of *C* or above was received, unless required to do so by department concerned. A written statement to this effect must be sub- ed to the Registrar by the appropriate department chairman.

OMPLETE/AUTHORIZED WITHDRAWAL

en another grade has not been assigned, the symbol *I* (Incomplete), the bol *W* (Authorized Withdrawal), or the symbol Z (Failure because unauthorized withdrawal) will be recorded. The symbol *I* indicates a satisfactory explanation has been given the instructor for the dent's inability to complete the required work of the course. At the on of the instructor, the grade of *I* may be recorded if a student, for ons beyond the student's control, is unable to complete the work of course, and if the instructor is informed of, and approves, such reasons ore the date when grades must be reported. The grade may be used if the student's prior performance and class attendance in the course e been satisfactory. Any failure to complete the work of a course which ot satisfactorily explained to the instructor before the date when grades st be turned in will be graded *F*. If acceptable reasons are later pre- ted to the instructor, that instructor may initiate an appropriate grade nge.

MOVING AN INCOMPLETE

information concerning the removal of a grade of Incomplete from a dent's record, consult the regulations of the college, school, or division cerned.

QUALITY-POINT INDEX

olarship is computed in terms of the quality-point index, obtained by iding the number of quality points by the number of semester hours which the student has registered, both based on his or her record in this versity. Quality points are computed from grades as follows: *A*, four nts: *B*, three points: *C*, two points: *D*, one point; *F* and Z, no points, for semester hour for which the student has registered. Courses marked *I*, *IP*, *P*, *NP*, or *W* are not considered in determining the index, except courses marked *I* will be considered when a formal grade is recorded. h the exception of Consortium courses, grades in courses taken at er institutions are not considered in computing the quality-point index.

Final Examinations

Final examinations for undergraduate courses are scheduled by the
of the Registrar. Examinations for courses numbered 201 or abov
scheduled, if desired, by the individual department or instructor.

Academic Dishonesty

The University community, in order to fulfill its purposes, must est
and maintain guidelines of academic behavior. All members of the
munity are expected to exhibit honesty and competence in their aca
work. Incoming students have a special responsibility to acquaint
selves with, and make use of, all proper procedures for doing rese
writing papers, and taking examinations.

Members of the community will be presumed to be familiar wit
proper academic procedures and held responsible for applying
Deliberate failure to act in accordance with such procedures wi
considered academic dishonesty. Acts of academic dishonesty are a
moral, and intellectual offense against the community and will be p
cuted through the proper University channels.

Copies of the University policy on academic dishonesty can b
tained from the following officers: all department chairmen, all acad
deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washi
University are subject to the provisions of the *Statement of St*
Rights and Responsibilities which outlines student freedoms and resp
bilities of conduct, the Judicial System for Non-Academic Studen
cipline, and other policies and regulations as adopted and promulgat
appropriate University authorities. Copies of these documents ma
obtained at the Office of the Vice President for Student Affairs. Sanc
for violation of these regulations may include permanent expulsion
the University which may make enrollment in another college or univ
difficult. Regulations or requirements applicable only to a particula
gram, facility, or class of students may not be published generally
such regulations or requirements shall be published in a manner re
ably calculated to inform affected students.

WITHDRAWAL

Withdrawal from a course or from the University requires the permi
of the dean of the college, school, or division in which the student is
tered. Permission to withdraw from the University will not be gran
student who does not have a clear financial record (see "Payme
Fees").

Each college, school, and division of the University sets deadline
for each semester concerning withdrawal. Withdrawal between these

the end of the semester is permitted only in exceptional circum-
ces.
l charges for courses dropped without the approval of the dean must
et by the student. Such unauthorized withdrawal will result in the
rding of a failing grade for the course or courses.

NGES IN PROGRAM OF STUDY

nges within a College, School, or Division—A student may not sub-
te one course for another, drop courses (see "Withdrawal" above),
ge status from credit to audit or from audit to credit without the ap-
al of the dean of the college, school, or division in which registered.
hange from one section to another of the same course may be made
the approval of the dean and the department concerned.
hange from one major field to another within the same college or
ol may be made with the approval of the dean.
ransfer within the University—Application for transfer to another col-
school, or division must be made to the appropriate admitting office
he form provided by the deans concerned. Transfer from the appro-
te preprofessional curriculum in Columbian College to bachelor's de-
candidacy in the School of Public and International Affairs may take
e upon the completion of 60 or more semester hours of course work
of the necessary procedures required by the particular school.
ith the exception of the School of Government and Business Admini-
tion which limits a student to 15 semester hours earned in non-
riculated status, a maximum of 45 semester hours earned in the
sion of University and Summer Students may be applied toward a
helor's degree in the other degree-granting colleges or schools of the
versity. Work done in the Division of University and Summer Students
not be counted toward a graduate degree unless prior written approval,
ined from the relevant degree-granting college or school, has been filed
he Office of the Dean of the Division of University and Summer
dents.
tudents transferring within the University are advised to study care-
y the requirements listed below under the heading "Graduation Re-
ements," and to note that, unless otherwise specified, in all under-
duate divisions, 30 semester hours, including at least 12 semester hours
he major field, must be completed while registered in the school or
ge from which the degree is sought. Upon transfer the student should
sult the dean concerned and understand clearly the requirements
ch must be fulfilled.

EDIT

dit is given only after registration for a course and satisfactory comple-
of the required work, or upon the assignment of advanced standing
ccordance with the regulations of the several colleges, schools, and
sions.
uditing—A person who has been admitted to the University may be

registered, with the permission of the instructor, as an auditor in a (no academic credit). An auditor is not required to take active part pass examinations. A student who takes a course as an auditor ma repeat it later for credit.

POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so e toward graduation from this University, must first secure the writte proval of their dean. In no event will credit in excess of what mig earned in a similar period in this University be recognized.

BALANCE SHEET

On request, the Office of the Registrar will issue to undergraduate d candidates a balance sheet showing the amount of work completed an requirements remaining to be met for the degree. A second balance is issued only if the student changes major or degree objectives.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request student or former student who has paid all charges, including any a loan installments, due the University at the time of the request. A $2 is charged for each transcript. When more than two transcript ordered at the same time, a $2 fee is charged for each of the firs transcripts and a $.50 fee is charged for each additional transcript. transcripts are not issued.

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be contin enrolled and actively engaged in fulfilling the requirements for the each semester of the academic year until such time as the degree ferred. Should the student break continuous enrollment at the Uni and not request and be granted a leave of absence (see below) assigned by the dean to inactive status (see below) he or she must for readmission and, if granted, be subject to the requirements and tions then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit degree, he or she may petition the dean for a leave of absence specific period of time, generally limited to one calendar year. A student who discontinues active enrollment in degree studies w being granted a leave of absence, or a student granted a leave wh

ot return to active study at the close of the period of approved absence, just apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave f absence.

NACTIVE STATUS.

nder the regulations established by each school and college, a student ay be considered in continuous pursuit of the degree while not enrolled courses at the University when engaged in the following: cooperative ngineering work semester; "year abroad program"; attendance at another institution with prior approval to have work transferred back to the W program; completion of outstanding work in courses in which a rade of "Incomplete" was received; or non-course instructional activities nique to the particular school or college.

Students must request to be enrolled in inactive status, in advance of e year or semester concerned, and be granted approval by their dean or the specific activity desired. This status is generally limited to one ear; no fees are assessed students while in this status.

RADUATION REQUIREMENTS

egrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have et the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence and her requirements for the degree for which registered; and be free from l indebtedness to the University. Enrollment is required for the semester summer session at the close of which the degree is to be conferred.

Application for Graduation—An "Application for Graduation" form ust be filed and the appropriate fee paid at the time of registration for e last semester or summer session of the senior or final year. Students mpleting degree requirements during the Summer Sessions will be warded diplomas (no formal convocation) dated September 30, *provided* ey have completed all degree requirements and have applied for graduaon as a part of registration for the Summer Sessions.

Scholarship—The student must meet the scholarship requirements for e particular degree for which registered.

Curriculum—Minimum curriculum requirements for each degree are ted under the college or school offering work in preparation for the gree.

Residence—Unless otherwise specified, in all undergraduate divisions the University, a minimum of 30 semester hours, including at least 12 urs in the major field, must be completed while registered in the school college from which the degree is sought. This requirement applies to dents transferring within the University as well as to students transring from other institutions. Unless special permission is granted by dean of the college or school concerned to pursue work elsewhere,

the work of the senior or final year must be completed in the college school from which the degree is sought.

The graduate student must meet the residence requirements for particular degree for which registered.

Attendance and Conduct—The University reserves the right to refu to confer a degree upon a candidate whose attendance or conduct has be unsatisfactory.

Thesis or Dissertation—A thesis or dissertation submitted in part fulfillment of requirements for a degree must be presented in its fi form to the dean of the college or school concerned no later than the d specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, come the property of the University and are deposited in the Univers Library, where the duplicate copies are bound and made available circulation. See the appropriate college or school in this bulletin regulations governing theses and dissertations.

HONORS

WITH DISTINCTION

In all undergraduate divisions of the University a baccalaureate deg may be conferred "With Distinction," at the discretion of the faculty, student meets the specific requirements of the college or school as follo

1. Columbian College of Arts and Sciences or School of Public a International Affairs—the attainment of the grades of *A* in 60 per cent the courses taken at GW; or
2. School of Education and Human Development or School of Gove ment and Business Administration—the attainment of a quality-point ind of 3.50 or higher in all course work taken at GW.

To be eligible a student must have completed at this institution at le one-half of the courses required for the degree.

SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of graduating class for outstanding achievement in the student's major fi on recommendation of the major department. The student must fulfill of the following requirements:

1. Candidacy for Special Honors must be approved by the faculty me ber representing the major department or field not later than the beginn of the senior year.
2. Such other conditions as may be set at the time the candidacy approved must be met.
3. At least one-half of the courses required for the degree must h been completed at GW.
4. The specific requirement of the college or school in which registe must be fulfilled, as follows: (a) Columbian College of Arts and Scie or the School of Public and International Affairs—grades of *A* or *B* in

cent of the courses taken at GW; or (b) the School of Education and man Development or the School of Government and Business Administration—a quality-point index of at least 3.0 on all course work taken GW.

E LIBRARY

students registered in the University have the privilege of using the iversity Library. Its stacks are open, and all students are welcome to owse. A card denoting approved enrollment for the current semester st be presented when books are borrowed for outside use.

The loan period for stack books is 14 days. Any book which circulates subject to recall by the library if needed for reserve or other use. Reve books must be used in the reserve reading room when the library open, except that they may be withdrawn for overnight use beginning 8:30 p.m. Transcripts of grades are withheld until a student's library cord is clear, with all borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar th its detailed regulations, available at any of the library's service desks.

GHT TO DISMISS STUDENTS

e right is reserved by the University to dismiss or exclude any student m the University, or from any class or classes, whenever, in the interest the student or the University, the University Administration deems it visable.

GHT TO CHANGE RULES

e University and its various colleges, schools, and divisions reserve the ht to modify or change requirements, rules, and fees. Such regulations all go into force whenever the proper authorities may determine.

GHT TO MAKE CHANGES IN PROGRAMS

e right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

NIVERSITY POLICY ON THE RELEASE F STUDENT INFORMATION

e Family Educational Rights and Privacy Act of 1974 applies to institunal policies governing access to and release of student education recds maintained by educational institutions which are recipients of federal nds. The University complies with this statute, which states, in part, t such institutions must:

1. afford students access to education records directly related to the
2. offer students an opportunity for a hearing to challenge such reco as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information fr their education records to persons outside the University, except provided by the Act and except for directory information as indice below. Information may be furnished to a student's parents with such written consent only upon certification of the student's fin cial dependency; and
4. comply with a judicial order or lawfully issued subpoena to rele a student's record, notifying the student of this action.

The University will release the following directory information u request: name, local address, and telephone number; name and address next of kin; dates of attendance; school, college, or division of enrollme field of study; credit hours earned; degrees earned; honors received; p ticipation in organizations and activities chartered or otherwise establis by the University (including intercollegiate athletics); and height weight of members of athletic teams. A student who does not wish directory information released must file written notice to this effect the Office of the Registrar.

Copies of the University's full policy statement on the release of stud information may be obtained from the Office of the Registrar.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A L and Found Office is maintained on campus in the Safety and Secu Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation those laws which proscribe possession, use, sale, or distribution of dr Members of the academic community should know that administra action, which may include dismissal from the residence halls, revocat of other privileges, or suspension or dismissal from the University, m be taken in order to protect the interests of the University and the ri of others.

SSOCIATIONS AND SERVICES

ONSORTIUM OF UNIVERSITIES OF THE ASHINGTON METROPOLITAN AREA, INC.

ne universities in Washington, D.C.—American University, Catholic niversity of America, George Washington University, Georgetown Uni-rsity, Howard University, and the University of the District of Columbia are associated in a Consortium through which they coordinate the use their respective facilities; Gallaudet College, Mount Vernon College, and inity College are associate members of the Consortium. Students in pproved programs leading to degrees in any one of these institutions ve the opportunity to select from the combined offerings of all the rticular courses which best meet their needs.

Participation is limited to degree candidates. The following, how-er, are excluded: students in canon law, dentistry, medicine, and eology. Law students are also excluded from participation, except for ndidates for the degree of Master of Laws at George Washington Uni-rsity and Georgetown University.

In special courses involving private instruction (such as music or art) tutorial study, if a special fee is charged, this fee is not covered by the onsortium agreement and must be paid by the individual student to the stitution administering the course.

Students are encouraged to study the announcements of programs of all e participating institutions. See page 28 for information concerning gistration for Consortium courses.

Registration forms and instructions are available from the registrar of e institution in which the student is enrolled. Students register and pay ition at their own institutions for all Consortium courses; course fees are ayable to the visited institutions.

HE READING CENTER

irector F.E. Hesser

he Reading Center offers individual diagnostic and corrective services r all levels: primary, elementary, secondary, and adult. In addition, spe-al reading improvement classes are conducted for high school and col-ge students as well as other adults. Instruction is available on an in-ividual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, domi-ance, and spelling tests; and various types of reading achievement and ptitude tests. Results are interpreted, and a written report is presented conference with the parents or the individual.

The special reading improvement classes for high school students, col-ge students, and other adults are offered throughout the year at stated tervals. Emphasis is placed on improvement of vocabulary, speed, com-

prehension, and study skills. Instruction in spelling is also provided needed. Mechanical aids such as the tachistoscope, rate accelerator, controlled reader are available for increasing speed of comprehensio

Fees—The fee for full-time George Washington University students alumni for reading classes (15 two-hour sessions) is $90. Others sho contact the Center regarding the fee schedule. All fees are payable advance at the Reading Center.

Reading instruction is required for first-year undergraduate stud with insufficient reading skills who are taking English 9.

THE SPEECH AND HEARING CLINIC

Director of Speech Pathology and Audiology J.W. Hillis

The Speech and Hearing Clinic offers diagnostic and remedial work children and adults with such communication difficulties as stutter lisping, cleft-palate speech, and cerebral-palsied speech; and with vo articulatory, and hearing problems. Diagnostic and remedial work is available for persons with nonstandard language usage due to such ditions as hearing loss, brain damage, mental retardation, and envi mental factors.

CONTINUING EDUCATION FOR WOMEN

Continuing Education for Women Center, College of General Studies, S 621-24, University Library, offers individual and group counseling serv including career and life planning, academic advising, and interpers skills, as well as credit and noncredit courses, evening year-long certifi programs for legal assistants, landscape architect assistants, publica specialists, administrative managers, and fund raising administrators, on-site seminars or workshops designed to meet the special needs government agencies, associations, and businesses. Brochures are avail

ENGLISH FOR INTERNATIONAL STUDENTS

Director G.R. Bozzini

This is a comprehensive program in English as a foreign language, signed to serve members of Washington's international community w ing either to enroll in University credit programs or to improve their c mand of English through an intensive or semi-intensive study progra general, students must have completed the equivalent of an Amer college-preparatory high school education.

Courses are offered at various levels of proficiency covering both and written communication and are scheduled in 14-week sessions du the fall and spring semesters and for an 11-week session during summer. Students entering the program will take a battery of tests to termine their levels of proficiency for placement in English and acad programs. Registration for the tests is held in advance at the Offic

nglish for International Students, Park Lane Building, Room 120, 2025 ve St., N.W., Washington, D.C. 20052. A $10 testing fee is charged each udent.

Persons writing from outside the United States and needing a student sa will be considered for an I-20 certificate of eligibility for student visa lidation upon submission of TOEFL or ALIGU test results. Those in- rested in applying for a degree program should see pages 25-26 for ldditional information.

ENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

irector F. William Rambo

ne Center for Academic and Administrative Computing is located on the ird floor of Lisner Hall, 2023 G St., N.W. The computer and other opera- onal supportive services are located on the first floor of Stuart Hall, 013 G St., N.W. These facilities normally are available 24 hours a day, ven days a week, to all faculty, staff, and students.

The Center provides computational facilities, conducts seminars, con- lts with users, and provides operational assistance as required. The enter operates an IBM 3031 (OS VS1) central processing unit and a DP 11 minicomputer which provides terminal and card remote-job-entry RJE) to the 3031 for students. There is a full range of compilers and pplication software packages.

Computer programming courses are offered by the School of Govern- ent and Business Administration, the Department of Statistics, and the chool of Engineering and Applied Science. In addition, many other de- artments offer courses that utilize the computer as a research adjunct to ourse work.

ENERAL ALUMNI ASSOCIATION

he objectives of this association are to unite the graduates who wish to ssociate themselves for charitable, educational, literary, and scientific urposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the niversity and who have left the University in good standing, or any erson who is or has been a member of the teaching, research, or adminis- ative staff of the University, or of the Board of Trustees of the Uni- ersity. Active members are those who are life members of the George Vashington University General Alumni Association or the Alumni As- ociation of any school of the University, or are current contributors to he George Washington University Fund.

All alumni are urged to keep the Alumni Office informed of changes f address or occupation and to supply information with regard to their llow alumni. The Office is located in Alumni House, 714 21st St., N.W., eorge Washington University, Washington, D.C. 20052.

VETERANS BENEFITS

The Veterans Counselor's office, located on the third floor of Rice Hall, 2 Eye St., N.W., assists students entitled to educational benefits as veter or as widows or children of deceased or totally disabled veterans with problems which may arise concerning their benefits. This Office also pr esses certification of enrollment and attendance to the Veterans Admir tration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or depende of veterans should consult with the veterans counselor prior to submitt application to the Veterans Administration. All such students should tain the instruction sheet issued by the veterans counselor which sets fo requirements to be fulfilled before certification of enrollment can be m to the Veterans Administration and which includes other information general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washingt D.C. 20421.

ROTC

George Washington University students may enroll in the Army RO program offered at Georgetown University, the AFROTC program at University of Maryland, or the Army ROTC or AFROTC at Howard U versity. Those interested should contact the ROTC enrollment offi at one of these universities. Credit for such courses may be transfer to George Washington University; prior approval is required by the d of the school in which the student is enrolled.

STUDENT LIFE

Vice President for Student Affairs William Smith, Jr.
Assistant to the Vice President for Student Affairs John Perkins

The Office of the Vice President for Student Affairs develops student services, policies, and procedures to complement the University's for instruction program. These activities are implemented through the offi of the Cloyd Heck Marvin Center, Counseling Center, Dean of Stude Educational Opportunity Program, Housing, International Students, S vices for Students with Disabilities, Student Activities, Student and Alu Career Services, and Student Health Service. The Office of the V President for Student Affairs is also responsible for programs and servi for alumni through the Office of Alumni Relations.

CE OF THE DEAN OF STUDENTS

of Students Gail Short Hanson
ant Dean of Students Cheryl Beil

Office of the Dean of Students provides counseling and information udents, and assists in program development for the Division of Stu- Affairs. Staff members are well-informed on University policies and rious student services provided on campus, enabling them to provide als and answers to many questions concerning general student life. nal letters of recommendation for students applying to graduate rofessional schools can be obtained from this office. The Dean udents is responsible for the services and programs offered by the seling Center, Educational Opportunity Program, International Stu- Advising, Services for Students with Disabilities, Student Health ce, and the Student and Alumni Career Services Office.

seling Center

tor E. Lakin Phillips
tant Director Patricia Zingheim

Counseling Center works to enable students to overcome obstacles hamper learning. The Center's services are offered to students and and include (1) resolution of the individual's educational, vocational, rsonal conflicts through short-term individual or group counseling, ional testing, or study skills training; (2) training of graduate nts, resident assistants, and paraprofessionals; (3) consulting on l health topics; and (4) development of new methods and programs student growth, such as counseling through written communication, taped counselor skills training, and interpersonal skills workshops. Center administers the Miller Analogies Test, admissions testing, pecial assessments for business and industry. Through its Office of nunity Services, the Counseling Center also provides vocational coun- and educational programs to the greater Washington community. dents may request a cost-free interview from 9 a.m. to 4:30 p.m., ay through Thursday, and from 1 to 4:30 p.m. on Fridays. If the nt decides to continue, a fee of $5 for full-time students ($15 for part- students) per appointment will be charged for short-term treatment. test battery is called for, an additional $16 materials fee will be ed. However, if financial need is a factor, fee adjustments can be

Counseling Center is located at 718 21st St., N.W.

national Student Advising Office

tor Patricia McMillen
tant Director Robert Locke

ed in the International House at 2129 G St., N.W., the staff of the national Student Advising Office provides advising and counseling in rs of personal and academic concern and visa regulations. This office a consultation, information, and resource center for the University's national population.

Educational Opportunity Program

Director Ronald Whitmore
Counselor Marquita Green

The Educational Opportunity Program is designed to provide select trict of Columbia high school graduates and other qualified Distri dents with financial and personal support as well as academic assist help them pursue undergraduate degree work at George Washingt versity. The Program Office is located at 2127 G St., N.W.

Services for Students with Disabilities

Director Linda Donnels

The Director of Services for Students with Disabilities works to ass the special services necessary for handicapped students to particip in their academic programs and the extra-curricular life of the cam provided for them through University or community resources.

Student and Alumni Career Services Office

Director Gordon Gray
Assistant Director Cynthia Gurne
Counselor Barbara Fitzgerald-McClain

The Career Services Office provides career guidance and place sistance to GW students and alumni. Some of the specific servi full-time and part-time job vacancy lists, career counseling, prog job-seeking skills, a resource center of literature on occupations ployers, and current information on government employment i testing dates and application forms. Seniors and alumni may also office to establish credential files for application to graduate sch for employment. The office is located at Woodhull House, 2033 G S

Student Health Service

Director Mary Capon, M.D.

The Student Health Service is an outpatient clinic located in Burns Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practition physician's assistants who are capable of addressing most of medical problems. Visits are cost-free and may be either arrange pointment or, during certain hours, secured on a walk-in bas routine laboratory tests may be performed in the Health Servi cost, many common medications are stocked to fill students' pres and allergy shots and immunizations are administered by the s for a minimal charge. A psychiatrist works in the Health Service students with mental health concerns.

For serious emergencies occurring during hours when the Health Service is closed, students may go to the Emergency Roo University Hospital for treatment. This arrangement is for e care only, and all fees are the responsibility of the student.

dents must be currently enrolled on campus in the University to
ve treatment at the Student Health Service. Students enrolled in the
ge of General Studies and Continuing Engineering Education Pro-
are not eligible. Students who so desire may engage physicians and
s of their own choice, but these students will be responsible for all
charged. The bills incurred from all services rendered outside of the
nt Health Service (for example, x-ray work, laboratory work, and
als to specialists or other outside physicians) are the responsibility
student.

TH AND ACCIDENT INSURANCE

Student Health Service has arranged for and endorsed group health
ccident insurance, on an elective basis, for those students who do
ave other coverage. Interested students should contact the Student
n Service or Office of the Dean of Students.

SING

tor of Housing Ann Webster
ciate Director David McElveen
tant Directors Marilyn Mundy, Robert Harris

lete information concerning the University's residence halls is avail-
rom the Director of Housing, George Washington University, Wash-
n, D.C. 20052. Information concerning off-campus housing near the
rsity also may be obtained at this Office.
mission to the University does not include a room reservation. The
nt will receive, with the notification of acceptance, University resi-
hall information, an application for residence hall space, and a
ration of intent to attend the University. The application for resi-
hall space must be accompanied by a $100 *nonrefundable deposit*.
housing deposit is credited toward the first semester's room charge.
s are leased for the academic year, and lease payment must be
by June 13 for the fall semester.

B1 Residence Hall Rates Per Person for Two Semesters*

len:

un Hall

uble room	$1,400
ple room	1,300

Women:

Hall

gle room	1,524
uble room	1,456
ple room	1,356

nce hall prices and allocation subject to change.

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—
double room .....

Building JJ (limited to sophomores, juniors, and seniors)—
apartment for 4 or 6 persons .....

Francis Scott Key Hall (limited to juniors and seniors):
apartment for two persons .....
apartment for three persons 1,524

Mitchell Hall (limited to sophomores, juniors, and seniors)
single room .....

Madison Hall
double room .....
triple room .....

Thurston Hall
double room, triple room, room for four .....
suite for six .....

Food Service

Resident freshmen and sophomores are required to choose one following three food service plans: the seven-day, 19 meals pe plan, at the rate of $1,184* for the academic year; the any 14 me week plan for $1,106* for the academic year; or the any 10 meals p plan at $1,054* for the academic year. Participation in the food plans is optional for junior, senior, and graduate students. Food payment does not cover University intersession or vacation peri meal cards admit bearer to dining rooms in Thurston and Mitche and to the second-floor contract dining room in the Cloyd Heck Center. Meal cards may also be used on a cash equivalency basi Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to m rangements with the George Washington University Housing Of garding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Munson Hall Apartments

Munson Hall is a University owned and operated apartment hou taining 15 one-bedroom and 54 efficiency apartments. Full-time and married students are eligible to reside in Munson Hall. Those to apply for an apartment should contact the Housing Office for a list application. All leases are for 12 months.

Milton and Guthridge Apartments

These apartment houses are University-owned, commercially buildings within the campus area. Each building contains efficie one-bedroom units which are rented only to full-time graduate stu an "as available" basis. Referrals to the resident managers of thes

* Food service prices subject to change.

are made by the Director of Housing when notice is received of cies. Leases are executed with the respective management companies re on a month-to-month basis.

D HECK MARVIN CENTER

tor Boris Bell
tant Director Donald Cotter

Cloyd Heck Marvin Center serves as the campus community center, ding services, conveniences, and recreational and social opportunities udents, faculty, staff, alumni, and guests. Its wide range of facilities des the setting for a variety of programs conducted by the University am Board; by the departments of drama, dance, and music; and by student and faculty organizations.

e Center Governing Board, representative of all segments of the Uni- y community, plays an important role in the functioning of the r by working closely with the full-time staff in the development of dures and policies which provide a framework for the Center's tion.

DENT ACTIVITIES OFFICE

tor Claudia Derricotte
tant Directors Gary Salussolia, Randall Mason

Student Activities Office assists individual students and organizations gram development, campus leadership development, and participation ecial projects, both within the University community and the com- ty at large. The Office serves as a clearinghouse for activities infor- n, registers and advises student organizations, and informs the Uni- ty community of activities and programs through monthly and annual cations. The Student Activities Office is also responsible for coordi- g the orientation program for new students, and for planning supple- al development programs for graduate and undergraduate students. nts who want to participate in the extracurricular phases of Univer- life should acquaint themselves with the facilities and staff of the ent Activities Office.

ditional information about the numerous student organizations and mittees is contained in the *Student Handbook*, compiled by and avail- at the Student Activities Office in the Marvin Center.

ent Government

George Washington University Student Association is comprised of ll-time and part-time graduate, professional, and undergraduate stu- who are registered for academic credit on campus. A body of elected ppointed individuals is responsible for representing the interests of nts at the University. The Student Association provides various es for students such as an academic evaluation, a student directory,

and the Student Advocate Service. Further information can be ob
from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also p
through participation in various administrative and Faculty Senat
mittees, advisory councils of the schools and colleges, selected com
of the Board of Trustees, and specialized bodies such as the Re
Hall Association, the Joint Food Services Board, and the Marvin
Governing Board. This involvement has helped develop policies a
grams beneficial to students and to the total University community.

Student Organizations

Students are encouraged to become involved with existing stud
ganizations or to initiate their own. There are approximately 160
zations on campus covering a broad spectrum of interests includi
demic, professional, international, cultural, political, service, sport
bies, recreational, religious and meditative, as well as social frat
and sororities.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to
of its students and encourages them to participate in the various r
organizations of their own choice. Catholic, Jewish, and Protestant
sponsor various groups and form a link between the University
religious community. The advisors of the religious organizations ar
able for counseling. Religious services and special observances
provided for the University community as announced.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally
artists is shown in monthly exhibits in the Dimock Gallery in Lisne
torium and in the art gallery of the Cloyd Heck Marvin Center. W
cooperation of the Curator of Art, an annual student art exhibit
sented.

Concert Series—The Department of Music presents a series of c
featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, in
studio performances, experimental events, television appearanc
lecture-demonstrations. Students may audition to become company
bers and have the opportunity to choreograph, perform, and gain
ence in the technical aspects of dance productions.

International Programs—The International Student Society pres
annual International Dinner in cooperation with foreign embassi
international restaurants. Other programs include regular forum
speakers on international topics.

Orchestra and Chorus Concert Series—The University Orches
Chorus are two facets of the lively arts available to students o

courses or as extracurricular activities. The Chorus presents major rmances to the University community three or four times a year, in- g regular winter and spring concerts. The University Orchestra pre- several performances annually.

gram Board—The University Program Board, composed chiefly of d and appointed students, is given primary responsibility and re- es for student programming on campus. Through its various com- s, and in cooperation with other campus groups, it regularly sponsors lectures, concerts, social activities, and special events.

ater—The University Theater produces four or five major plays and als during the year on the proscenium thrust stage in the Dorothy Marvin Theatre or in Lisner Auditorium. Additional works, including al and experimental plays, are produced in a more intimate studio r. Students have the opportunity to participate in all aspects of r and may receive credit toward their B.A. or M.F.A. degrees for of their production work.

LETICS, INTRAMURAL SPORTS, AND RECREATION

University is a member of the National Collegiate Athletic Associa- the Eastern College Athletic Conference, the Association for Inter- iate Athletics for Women and the Eastern Association of Inter- iate Athletics for Women. Its varsity teams compete against major rsities throughout the Midwest and Eastern Seaboard in such sports sketball, baseball, soccer, tennis, golf, wrestling, crew, swimming iving, squash, badminton, volleyball, and gymnastics.

Charles E. Smith Center for Physical Education and Athletics offers facilities for student use, including courts for basketball, volleyball, adminton; a jogging track; a swimming pool; wrestling, gymnastic, veight rooms; handball and squash courts; and a sauna and lockers. in the Smith Center, the men's and women's athletic departments a broad program of intramural and recreational activities designed commodate various levels of skill, experience, and interest.

COLUMBIAN COLLEGE OF ARTS AND SCIENC

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Assistant Deans B.J. Dunham, R.E. Knowlton, J.L. Métivier, Jr., R.C. Rutledge

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RODUCTION

its founding in 1821, Columbian College of Arts and Sciences, the
l arts college of the University, has continued to expand and develop
the city of Washington. Its central situation makes participation in
ife of the nation's capital convenient for resident students. The cos-
olitan nature of the student body reflects the atmosphere of a great
d capital. Because the students come from the 50 states and from
oreign countries, class discussions and casual student conversations
nriched by a challenging variety of viewpoints.

e Columbian College program is a contemporary application of the
ric liberal arts tradition. Its purpose is to enable the student to de-
both particular abilities and general awareness as a human being.
mands of the student a thorough acquaintance with one major area
arning and at the same time an understanding of how that specializa-
fits into the larger context of the scientific, social, and moral problems
h confront modern society. It stresses a broadly enlightened per-
tive which encourages its graduates to grow through the years in
ty and wisdom.

roughout its history, the College has kept pace with, and often led,
ements of reform in higher education. Sensitive to the rapidly chang-
patterns of student and social needs, notably the increasing maturity
knowledge of the modern incoming freshman, the College has from
to time inaugurated major changes in its academic programs. In
summary, present patterns are designed to (1) permit the able student
arn the baccalaureate degree in less than the standard four years, either
arning credit through a wide variety of examinations or by performing
excellence within a 90-semester-hour three-year program; (2) provide
student with a greater opportunity to design an individual academic
gram by eliminating almost all specific course requirements except in
major field; (3) encourage an early and close association between the
ent and individual faculty members in the field of the student's chief
rest; and (4) foster a spirit of community and shared responsibility
ween faculty and student.

pportunities exist for double majors within the College; interdisci-
ary programs; and, in the case of the student who finds no existing
or or program suitable to individual educational goals, special inter-
iplinary programs which may be developed by the student, in con-
ation with departmental advisors and with the final approval of the
mmittee on Curriculum.

olumbian College offers programs leading to the degrees of Associate
Arts, Bachelor of Arts, and Bachelor of Science; prelegal and pre-
dical programs; and the first two years of the professional programs
ublic and international affairs.

olumbian College has degree-granting authority over certain programs
ch combine on-campus and off-campus courses. These include the
helor of Science degrees in Geodesy and Cartographic Science. As

most of the courses in the first two years of these programs are
on campus, students may be admitted as full-time on-campus st
in Columbian College. After the first 64 hours, most of the cours
offered at off-campus locations. Students are then required to r
for their course work with the College of General Studies, which ad
ters off-campus programs. Students attending off-campus classes a
pected to provide their own transportation to and from class. Dis
involved vary from two to 20 miles from the campus area. Columbia
lege also has degree-granting authority over two other programs whi
usually offered off campus and administered by the College of G
Studies: Associate in Arts in General Studies and Bachelor of G
Studies (areas of concentration in economics, history, mathematics,
cal science, psychology, and sociology). For further information
these programs, see the *College of General Studies Bulletin*.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the pr
of studies contemplated are required.

Requirements for admission to the freshman class are as follows

1. An acceptable certificate of graduation from an accredited sec
school, showing at least 15 units* which must include four years o
lish; at least two years of one foreign language; two years of s
preferably with laboratory instruction; two years of social studies,
which must be American history; and one year of college prep
mathematics beyond introductory algebra.
2. The principal's statement that the applicant is prepared to und
college work.
3. College Entrance Examination Board scores submitted on the
lastic Aptitude Test and the English Composition Achievement Te

It is recommended that the examinations be taken in Decem
January. Scores on tests taken in the junior year may be submitte
rangements for tests are the responsibility of the applicant and sho
made with the Educational Testing Service, Princeton, N.J. 08540; o
Center Street, Berkeley, Calif. 94704, not less than one month bef
date of the test. In applying for the test, the applicant should speci
the scores be sent to the Office of Admissions, George Washingto
versity, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; ho
the American College Testing battery scores will be accepted. The
cant should request that these scores be sent to the Office of Adm
directly from the American College Testing Program, Iowa City, I
is recommended that the applicant take the tests in October of the
year.

The Committee on Admission and Advanced Standing will c
the adequacy of the qualifications of an applicant who, because of
circumstances, does not present all of the formal requirements state

* A unit represents a year's study in a secondary school subject, including in the
not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work

Committee may prescribe appropriate scholastic-aptitude tests of the ersity. Students admitted with deficiencies in secondary school s will be required to begin removing such deficiencies within the first , by appropriate courses or examinations. Courses taken to clear ance deficiencies will not fulfill Columbian College meaningful initia- requirements as set forth on page 74, or distribution require- ts prescribed by the School of Public and International Affairs.

ULATIONS

ulations regarding admission, registration, fees and finances are stated ages 20-32; other University regulations, on pages 44-52.

OLARSHIP REQUIREMENTS

DEMIC WORK LOAD

encourage academic performance of high quality, the student's work is limited.

full-time student not on probation may take a course load of as much 7 semester hours. A student employed more than 20 hours a week who ot on probation may take not more than 10 hours.

he amount of work taken by a student on probation may be limited he Committee on Scholarship.

full-time student who, during the immediately preceding semester, has ived no grades below *B* and has earned grades of *A* in three courses ling at least nine semester hours may take 18 or 19 hours. An employed ent who, during the immediately preceding semester, has received no es below *B* and has earned grades of *A* in two courses totaling at least semester hours may take 12 hours.

student who accepts employment after registration or at any time ng a semester must report that fact immediately to the dean so that academic program may be adjusted, if necessary.

ENDANCE

student is held responsible for all the work of the course in which stered, and all absences must be excused by the instructor in charge re provision is made for the student to make up work missed.

ING AND DROPPING COURSES

er registering, a student may add or drop courses only by means of an ial "drop-add" form available in the Office of Columbian College. lure to drop a course may result in a failing grade. The deadline for add- a course during the regular fall or spring semesters is the end of the week of classes. However, if the student presents a note from the in- ctor explaining the special circumstances, and granting permission, a rse may be added up to the end of the second week of classes.

The deadline for dropping a course without academic penalty is t
of the fourth week of classes in the fall and spring semesters. The
line for complete withdrawal from all courses without academic p
is the end of the ninth week of classes. After the deadlines, p
changes require that the student present a petition to the Dean's Cou

USE OF CORRECT ENGLISH

The use of correct English, oral and written, is required in all c
Any student whose English in any course whatever is deemed u
factory may be reported by the instructor to the dean and to the
mittee on the Use of Correct English. The chairman of the Committe
assign supplementary work, without academic credit, varying in a
with the needs of the student. If the work prescribed is equivalen
course, the regular tuition fee is charged. The granting of a degre
be delayed by failure to make up any such deficiency in English
satisfaction of the Committee and the dean.

DEAN'S LIST

The name of every student who takes a minimum of 15 semester
(none of which may be in pass/no pass courses) in any one sem
who receives grades of *A* in at least 60 per cent of the course work
in that semester, and who has no grades below *B* for that semes
placed on the Dean's List for that semester.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to
good standing.

The following rules governing probation and suspension are app
as stated to students enrolled for a full-time program (12 semester
or more) during the fall or spring semester. Students enrolled for les
12 semester hours during the fall or spring semester and students e
during the summer sessions are subject to probation or suspension
basis of their record for four courses (three or more semester ho
credit each), or multiples thereof, rather than on their record in a
semester.

Probation—A student who in one semester receives two grades
courses carrying three or more semester hours of credit each,
equivalent, is placed on probation. A student in the first semes
probation who receives one grade of *F* in such a course will be co
on probation for a second semester. Two grades of *D* will be tre
equivalent to one grade of *F* in determining probation. Any grades o
F replacing earlier grades of *I* will be considered a part of the rec
the semester during which the *I* is removed. A student on probation
12 or more semester hours whose grades are all *C* or better is re
from probation.

Suspension—The following cases constitute grounds for susp

ree grades of *F* in courses carrying three or more semester hours edit, or the equivalent, in one semester; (2) two grades of *F* in such ses in the first semester on probation; (3) one grade of *F* in such ses in any later semester on probation. Two grades of *D* will be ed as equivalent to one grade of *F* in determining suspension. Any es of *D* or *F* replacing earlier grades of *I* will be considered a part of ecord for the semester during which the *I* is removed.

e minimum period of academic suspension is one fall or one spring ster. Final dates for applying for readmission are the same as those rning undergraduate admission (see page 20). A suspended student ing readmission must submit evidence to the Committee on Admis- and Advanced Standing of conduct during absence from the Uni- ty which indicates that the student will profit from readmission. A ent suspended twice for poor scholarship will not be readmitted.

id-semester Warning—When, at the end of the sixth week of each ester, instructors file in the Office of the Dean the names of freshman sophomore students who are doing unsatisfactory work, a notice of ing is sent to the student and a copy filed with the appropriate ad- r. A warning constitutes notice to the student to consult the instructor advisor at the earliest opportunity.

OMPLETE/AUTHORIZED WITHDRAWAL

ditions under which the grades of *I* (Incomplete) or *W* (Authorized drawal) may be assigned are described on page 45.

emoving an Incomplete—The grade of *I* must be removed no later than last day of the examination period for the fall or spring semester im- iately following the semester or summer session in which the grade of assigned. An "Incomplete" that is not removed within this period is matically changed to an *F*. In cases of well-documented extenuating umstances, an instructor and a student may jointly petition the dean, ne appropriate committee, for additional time in which to complete the k of the course. Such petitions should be submitted within the same od. The grade of *I* cannot be removed by reregistering for the course , or by taking its equivalent elsewhere.

RESPONDENCE AND HOME-STUDY COURSES

credit is given for work done by correspondence or in home-study ses.

ASSIFICATION OF STUDENTS

tudent becomes a *sophomore* upon completion of 30 semester hours, nior upon completion of 60 semester hours, and a *senior* upon com- ion of 90 semester hours.

n *unclassified* student is one who is not a candidate for a bachelor's ee (normally because the student already holds one), but who wishes

for valid academic reason to take a limited program for a limite
Registration in this status is permitted only with the prior approval
appropriate Dean's Council.

SOPHOMORE YEAR IN PARIS PROGRAM

Freshmen who have received grades of *C* or higher in all course
during the first semester may be eligible to participate in the
Washington University-American College in Paris Sophomore Ye
gram. Qualified students will be encouraged to accept this oppo
to profit from the cultural and intellectual riches of Europe by
ing their second year living and studying in Paris. Credits ear
this program will be transferable toward a degree in Columbian
of Arts and Sciences. Since all courses are taught in English, a kno
of French is not mandatory, but is desirable. More information
secured from Assistant Dean J.L. Métivier at the Office of Col
College.

INACTIVE STATUS

Students in Columbian College who wish to interrupt their studi
apply to the dean for Inactive Status. They may apply at any time
the close of the registration period of the first semester for whi
status is desired. If approved, Inactive Status (for which no fee is c
assures the student for a period of one calendar year that re-entr
the College may take place under regulations prevailing at the
last registration. After the expiration of one calendar year of I
Status, *or if the student has attended any other college or universi
ing absence from this University* (but see below), the student must
regular readmission procedures and resume studies, if readmitted,
regulations then current.

Students who wish to attend another college or university,
country or abroad, during the period of Inactive Status may, by pri
tion to the dean, request approval of the planned program and, if a
is given, be assured of re-entry within one year under regulatio
vailing at the time of last registration here.

LEAVE OF ABSENCE—See page 48.

ADVISORY SYSTEM

Each student is provided with both academic advising and personal
seling. *Academic* advising is performed by members of the faculty s
for their knowledge of academic programs, and each student, befor
tration, makes up a program in consultation with the advisor assig
student who has *not* selected a major field receives academic a
from a member of the Columbian College Committee on Student A
(see page 66). A student who has officially declared a major field r

demic advising from the appropriate department, or from an inter-partmental committee. *Personal* counseling is available through the fice of the Dean of Students or through the University Counseling Center. l students are encouraged to maintain close contact with their advisors. Students who intend to transfer after the sophomore year to the School Public and International Affairs are assigned special advisors to assist m in planning their programs.

An academic warning system permits early attention to students whose rk falls below required standards. In such cases, students are asked consult regularly with their advisors. On request, and with the student's rmission, copies of academic warnings or probation notices may be sent parents or guardians, who are themselves welcome to meet with mem-rs of the advisory staff.

ADEMIC ADVISING CENTERS

ch department has set up Academic Advising Centers where both gen-al educational counseling and specific major-field advising are available students. The locations and hours of these Centers may be obtained m departmental offices.

As the freshman student deliberates choice of a major, he or she should nsult with faculty advisors in as many of these Centers as he or she shes. Once a major is officially declared, the student then receives all ademic counseling from the Academic Advising Center of the major partment.

ER ADVISING

supplement academic advising by faculty members in Columbian Col-ge, peer advising is also available during fall and spring registration and e Summer Advance Registration Program. Undergraduate peer advisors, presenting a broad range of major fields, are centrally located to offer heduling help and course selection advice to fellow students. Peer lvisors are available to provide assistance throughout the academic ar. A roster of current advisors is published following each registration riod.

ECLARATION OF MAJOR

e student is encouraged to select and officially declare a major field rly, normally no later than the end of the freshman year. All students, wever, whether they are entering freshmen or transfer students, must cure the advisor's signature on a proper form (obtainable in the Office of olumbian College), and return the form to the Office of Columbian College order to declare a major. No student is considered to have a major until is process is completed. Thereafter, the student receives academic guid-ce from a faculty advisor in the major-field department.

COLUMBIAN COLLEGE GENERAL COURSE REQUIREMENTS

All candidates for the degree of Bachelor of Arts or Bachelor of S are admitted to a general arts and sciences curriculum until they d a major field. Except for two general course requirements, all curri requirements leading to the degrees of Bachelor of Arts and Bache Science are established by the various major field departments o grams.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate ade achievement in English Composition, either by examination or by Engl 9 or 10, and Engl 11 or 12. This requirement may not be postp

2. Each student at some point in the college career must undert meaningful initiation into the three divisions of knowledge: human natural and mathematical sciences, and social sciences. As each field will normally represent one of these three areas, the requirement be fulfilled by taking no less than six semester hours in each of the two areas. These six credits may be in approved introductory cours in approved advanced courses if the student is qualified and receive instructor's permission. Courses taken to clear entrance deficiencies d satisfy meaningful initiation requirements. Applied and tool courses d satisfy the requirement for meaningful initiation into the human All science courses taken in fulfillment of the meaningful initiatio quirement must include laboratory instruction. Normally, these six units must be taken in a single subject or department. Courses s waived (no credit assigned) cannot satisfy the meaningful initiatio quirements.

It is recommended that courses taken to satisfy the meaningful initi requirement be selected from the following:

Humanities

Art 31-32, 71-72; Classical languages 71, 72, 108, 113; Chinese 163-164; E 51-52, 61-62, 71-72, 191-192; French 51-52, 60, 91-92; German 51-52, 10 Music 3-4; Philosophy 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 17 ligion 9-10, 59-60, 21-22, or 23 and 9; Slavic languages 71, 91-92; Spanish 91-92; Speech and Drama 45, 49, 133, 143, 144, 165, 166, 192.

Natural and Mathematical Sciences

Biology 3-4, 11-12; Chemistry 3-4, 11-12; Geology 1-2, 5 and 2, or 5 a Mathematics 31-32, 32-33, 41-42, 51-52, 53-54, 9-10, or any combination upper-level math courses; Physics 1-2, 9-10; Statistics 51 and 97 or 105, 97 or 105, 91 and 97, or 111-12.

Social Sciences

American Civilization 71-72; Anthropology 1-2; Economics 1-2; Geog 1-2; History 71-72, 39-40, 72 and 91, 40 and 91; Journalism 71-72, 111 a Political Science 1-2; Psychology 1 and 5, 6, 8, 22, or 29; Sociology 1 a 100-level Sociology course.

The following courses will not satisfy the meaningful initiation require Applied courses in art (also Art 1); applied courses in music and in speech drama (SpDr 1 and 11); English composition courses; basic (first- and se year) foreign language courses; Math 3, 6, 30.

uired Placement Examinations

nglish—Students whose College Board English Composition Achieve-t Test scores suggest that they will benefit from more intensive training ompositional skills may be assigned to Engl 9 or may be tested in abulary, spelling, grammar, standard usage, and writing skill before ement in either Engl 9 or 10. Students whose Achievement Test scores cate superior competence will be allowed to waive the Engl 10 re-ement. Those whose scores indicate markedly superior competence be allowed to waive both Engl 10 and Engl 11 or 12.

ote: A diagnostic test in reading proficiency is required for students olled in Engl 9. For those whose test results show a reading deficiency, ncredit reading course—given by the Reading Center—is required. The ding course meets three hours a week for a maximum of 10 weeks.

nglish for International Students—see page 302.

oreign Languages—A student who has not been granted advanced ding and who wishes to continue in college the language begun in high ool must take a placement examination in one of the following: Chi-e, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish. n completion of the examination, assignment is made to the appropriate rse.

Mathematics—New students who wish to register in Math 30, 31, or are required, prior to registration, to take a placement examination in ebra and trigonometry; those wishing to register in Math 51 are re-ed, prior to registration, to take a placement examination in algebra.

eign Language Requirement

nost major programs requiring foreign languages a student must com-e satisfactorily the equivalent of two years of college work in a single ign language.

student offering for admission four acceptable high school units of a le foreign language, or the equivalent, is not required to take any ign language.

student who offers less than four units and wishes to continue the e language must take the language placement test.

many instances foreign languages are required or recommended as aration for advanced work. The student should consult the advisor at appropriate foreign languages may be included, when necessary, in tudent's program.

- and Second-Group Courses

-group courses, those numbered from 1 to 100, are intended primarily reshmen and sophomores. Second-group courses, those numbered 101 to 200, are intended for juniors and seniors. However, a qualified man or sophomore may, with the permission of the advisor and of department concerned, take second-group courses. Such qualification hieved by passing or waiving introductory courses or prerequisite es in the first group.

Courses in the Major Field or Department

Every student is given the opportunity of taking a wide range of l
arts subjects—humanities, natural and mathematical sciences, s
sciences—both as a means of laying the groundwork for more
centrated major-field study and as a means of determining what acad
area is best adapted to the student's interests and aptitudes. In ord
enhance this opportunity and to avoid over-specialization once a m
has been selected, the student must take at least 60 hours of course w
including the general course requirements of Columbian College, ou
the major-field department or major program. (This does not app
students in the 90-hour degree program.)

Professional Courses

Except for majors in applied mathematics and for students interest
teacher certification or intending to apply for the combined degre
Bachelor of Arts and Doctor of Medicine, no more than 12 hours of
fessional courses, e.g., courses offered in units of the University other
Columbian College, may be included in the hours required for the ba
lor's degrees in Columbian College. Students electing professional co
under this rule must obtain the approval of the dean before registra

Human Kinetics and Leisure Studies

Courses in Human Kinetics and Leisure Studies are not required
are such courses generally acceptable for credit toward a degree.
prior petition to the dean, however, certain courses in dance as a
form may be included in the 12 hours of professional credit permitted

Experimental Humanities/Service-Learning Program

A maximum of 21 semester hours in any combination of Experim
Humanities courses and Service-Learning Program courses may be cre
toward bachelor's degrees in Columbian College.

Earning Credit By Examination

Assuming there is no duplication of coursework earned, a maximu
30 semester hours of credit may be assigned for any combination o
following:

College Entrance Examination Board Advanced Placement Tests—C
may be granted for college-level courses taken in an approved secon
school if substantiated by satisfactory performance on the Adva
Placement Tests. See page 24 for further details.

*College Entrance Examination Board College-Level Examination
gram (CLEP)*—Prior to matriculation, credit may be assigned for
General Examinations passed at the 50th percentile or above. Credit
be assigned for any CLEP Subject Examinations passed at the level re
mended in the College Board model policy. A few examinations in
categories, however, are unacceptable for credit. See page 23 for sp
exceptions.

After matriculation, credit for CLEP Subject Examinations will not be igned without special authorization by the Columbian College depart-nt governing the subject involved. See pages 22-23 for additional in-mation.

Special Departmental Examinations—A student may request any depart-nt of Columbian College to offer a special examination covering the bject matter of any specific course. (If an appropriate CLEP Subject amination is available, the department may choose to employ it.) Ap-val of such a request is not automatically granted; the student must er evidence of sufficient background to have a reasonable command of subject matter. A student who has previously taken examinations to ive course requirements may not subsequently take examinations for edit in the same courses. Assigning credit (or waiving a requirement) by ecial departmental examinations will depend on the department's evalua-n of the examination paper. These examinations will normally be of at st three hours' duration. A fee of $25 for each course examination is arged for preparation, administration, and grading of the examination.

aiving Introductory Courses by Examination

Placement Tests—Many departments in Columbian College, including glish, mathematics and all foreign languages, require students to take acement tests to determine level of proficiency or eligibility for specified urses. The student is placed in an appropriate course on the basis of ese tests. There is no charge to the student for placement tests, and no edit (advanced standing) is awarded for courses bypassed or waived as result of these tests.

Waiver Examinations—Several departments in Columbian College, in-uding English, history and sociology, offer periodic waiver examinations r introductory courses. Such examinations may be attempted at the tion of the student; a fee of $5 is charged. Specific departments should consulted for further details. *Passing a waiver examination does not title a student to any semester hours of credit.*

rning Additional Semester Hour of Credit

rmally, no deviation is permitted from the number of semester hours of edit given in parentheses after the title of each course. In exceptional rcumstances, however, and with the prior approval in writing of the structor and the dean, a student may register for and earn an additional mester hour of credit in certain appropriate second-group (upper-vision) courses by doing a significant amount of extra work as assigned d supervised by the instructor. This privilege is not applicable during the mmer Sessions.

REPROFESSIONAL REQUIREMENTS

udents who plan to major in any program offered by the School of blic and International Affairs are registered during the freshman and phomore years in Columbian College. Requirements for the first two

years of these programs, as well as requirements for the premedical gram, are listed on the following pages.

Premedical Curriculum

A premedical student who intends to work toward a bachelor's d fulfills the general requirements of Columbian College (see pages and may follow the major field curricula of any Columbian C department. Each premedical program must be approved by the medical advisor. For admission to most medical schools the student have a minimum of 90 semester hours applicable towards a degree approved college of arts and sciences; the 90 hours must include

1. *Biology*: eight semester hours. This may be either in general biol zoology but may *not* include separately credited courses in botany.
2. *Chemistry*: eight semester hours of general inorganic chemistry may include qualitative analysis), including four semester hours of labor and six to eight semester hours of organic chemistry, including laborato
3. *Physics*: eight semester hours, including at least two semester ho laboratory.
4. *English*: six semester hours. This may be the usual introductory course or its equivalent.

Many medical schools have additional entrance requirements, which are courses in biochemistry, embryology, histology, genetics mathematics. Even where such courses are not actually required, the strongly recommended.

With the exception of these specific requirements applicants are to follow their personal interests in developing their premedical co of study. A well-balanced program, rather than a specific field, criterion by which an applicant is judged. It is not advisable to courses that appear to cover subject matter in the medical program

While well-qualified candidates are eligible for admission after pleting the minimum 90 semester-hour requirement, the majority of cants are found to be better prepared for the study of medicine afte years of college work.

Preparation for Law School

The best undergraduate preparation for law school is a solid, liberal education. Columbian College, therefore, does not prescribe a legal" curriculum. One of the Assistant Deans in the College, howe designated as Pre-Law Advisor, and students interested in legal s should consult him for information and guidance.

Chinese Language and Literature

The first two years in preparation for the Bachelor of Arts degree w major in Chinese Language and Literature in the School of Public International Affairs consists of a minimum of 60 semester hours. student must, during the freshman year, demonstrate adequate ach ment in English Composition, either by examination or by taking E or 10, and Engl 11 or 12. The student must also undertake a mean initiation into the three divisions of knowledge: humanities, natura

thematical sciences, and social sciences. As the major field represents e of these three areas, the requirement may be fulfilled by taking no s than six semester hours of approved introductory courses, or six nester hours in approved advanced courses if the student is qualified d receives the instructor's permission, in the natural and mathematical ences and in social sciences. Students must include in their program study Chin 1-2, 3-4, and 9; Chin 7-8 and 9; or Chin 5-6. Chin 5-6 is eferred.

st Asian Studies, Middle Eastern Studies, or ternational Affairs Curriculum

st two years in preparation for the Bachelor of Arts degree in the field East Asian Studies (China or Japan), Middle Eastern Studies, or Inter- tional Affairs in the School of Public and International Affairs:

		Semester Hours
English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72	6
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish	12–16
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from Stat 51, 53, 91, 111, and one course selected from Stat 97, 105, 112	6–8
Social Science:	Econ 1–2; Hist 40 and 72; PSc 1 and 2, or 2 and 3, and 91	21
‡Elective:		6–12
	Total	60

blic Affairs Curriculum

st two years in preparation for the Bachelor of Arts degree in the field Public Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; *Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group Philosophy courses; Rel 21, 59–60; AmCv 71–72	6

a student elects six semester hours of literature in any foreign language, this cannot be used atisfy the language requirement.

ain 5-6 is required for East Asian Studies (China focus) majors; Japn 3-4 is required for East an Studies (Japan focus) majors. Greek and Latin are not acceptable for International Affairs ors. Middle Eastern Studies majors may substitute other languages with the approval of the gram advisor.

redit is not given for courses elected in the Department of Human Kinetics and Leisure dies.

		Sem. Hr.
Language or Statistics:	NOTE: This requirement may be satisfied by two years of one foreign language* or 12 semester hours of statistics. Statistics courses taken to fulfill this requirement may not also satisfy the math/science requirement below.	
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from Stat 51, 53, 91, 111, and one course selected from Stat 97, 105, 112	
Social Science:	Econ 1–2; Hist 40 and 71–72; PSc 1 and 2, or 2 and 3	
†Elective:		
	Total	

Urban Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the of Urban Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	
Humanities or AmCv:	Art 31–32 or 71–72; Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72	
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10	
	NOTE: If a student elects two years of a foreign language, two semesters of statistics courses may be substituted for the math/science requirement.	
Social Science:	Econ 1–2, Hist 71–72, and PSc 2	
	Six semester hours selected from the following: Hum 40, 721; Soc 2	
Elective:	Students may substitute some of the required courses for the major (see page 173) for elective courses during the sophomore year	
	Total	

DEGREE PROGRAMS

ASSOCIATE IN ARTS DEGREE

The Associate in Arts Degree may be granted to a student who has pleted 60 semester hours in arts and sciences with acceptable grades who has fulfilled the general requirements described on pages 74-

* Greek and Latin are not acceptable for satisfying the foreign language requirement for Affairs majors.

† Credit is not given for courses elected in the Department of Human Kinetics and Studies.

tion, the degree may be awarded to pre-public and international af- students upon completion of the curriculum specified for the first years of the appropriate program. The last 15 semester hours of the ram of study must be completed in residence in Columbian College. udent wishing to receive this degree must file an Application for luation and pay the $10 graduation fee at the time of registration for semester or summer session in which the requirements will be com- d.

BACHELOR'S DEGREES

mbian College offers programs leading to the degrees of Bachelor of and Bachelor of Science.

cooperation with the School of Medicine and Health Sciences a n-year curriculum leading to the combined degrees of Bachelor of and Doctor of Medicine is offered.

r teacher certification for Columbian College students, see page 106.

uirements for the Degrees

OLARSHIP

hundred and twenty hours of course work must be passed and a ity-point index of 2.00 achieved in courses graded on a four-point . At least 60 hours of course work, including the general course re- ements of Columbian College, must be taken outside the major-field rtment or major program.

ne index is obtained by dividing the number of quality points by the ber of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. the number of quality points and the number of semester hours of ses are based on the student's record at this University. The index mputed as follows: *A*, four points; *B*, three points; *C*, two points; ne point; for each semester hour which the student has taken. Courses ked *F*, *W*, *I*, *IP*, *P*, or *NP* are not considered in determining the index, gh courses passed with *P* count toward the 120-hour overall re- ement. (When a formal grade is recorded for an Incomplete, a grade or better will be included in the computation of the index.) A grade ncomplete which is not removed within one semester is automatically ged to an F. Grades earned in courses taken at another institution are considered in computing the index. At the time of graduation, a ent must be in good academic standing. See page 86 for scholar- requirements applicable specifically to departmental majors.

DENCE

the *standard 120-semester-hour program*—A minimum of 30 se- er hours, including at least 12 hours in the major field, must be com- d in residence in Columbian College. *Unless special permission is ted by the dean to pursue work elsewhere, the work of the senior must be completed in residence.* This requirement applies to students

transferring within the University as well as to students transferring other institutions.

For the 90-semester-hour program—The last 60 semester hours, inc at least 12 hours in the major field, must be completed in reside Columbian College.

Summer work may be counted in residence. For regulations gov students who are absent from the University for one semester or see "Leave of Absence" and "Inactive Status," pages 48-49 and 72.

CURRICULUM REQUIREMENTS

A change in degree candidacy within Columbian College (e.g., from lor of Arts to Bachelor of Science) requires the permission of the The degree requirements effective at the time the change is ap must be met.

First-group courses may be required as prerequisites to the maj because of their introductory character they cannot be counted as such programs. (See "Explanation of Course Numbers," pages 194-9

PASS/NO PASS OPTION

A junior or senior student in Columbian College who is in good s may, with the approval of the advisor and the dean, take one cours mester and receive a grade of *P*, Pass, or *NP*, No Pass. No stude be allowed to take more than four pass/no pass courses und regulation. The student may, however, also receive grades o in the proseminar for field-of-study majors and in other courses n using such grades. A student must sign up for the pass/no pass at registration. Under no circumstances may a student chang pass/no pass status to graded status, or vice versa, after the registration. Courses required in the student's major field (cour quired in the major department or those required outside the ma partment) may not be taken on the pass/no pass basis. A trans dent may not choose this option until the second semester of enroll this University.

TUTORIAL STUDY

A junior or senior of demonstrated capacity, with a special interes subject matter of a regularly listed course, may be permitted to torial study in residence under the personal direction of the ins in accordance with the rules of the appropriate department and w approval of the dean. Credit under this plan is limited to the semester hours of credit designated for each course in the list of of instruction. It assumes frequent and regular conferences betw student and instructor.

STANDARD 120-SEMESTER-HOUR PROGRAM

hundred and twenty semester hours of course work are required for uation. At least 60 hours of course work, including the requirements ed on pages 74-75 and 81-82, must be taken outside the major depart- t or program. The student should consult the advisor at each registra- about choice of courses.

ch student should declare a major as soon as possible, preferably upon pletion of 30 semester hours. A student may change the major with consent of the dean and of the department or committee concerned; student must meet the requirements for the new major in effect at time the change is approved.

udents transferring from other institutions or from other schools, ges, or divisions in this University, with major requirements wholly ubstantially met, must satisfy the residence requirement of Columbian ege (see pages 81-82).

90-SEMESTER-HOUR PROGRAM

90-semester-hour degree program is designed for the exceptionally student. This program, which leads to the regular Columbian College ees, makes it possible to graduate in three normal academic years a total of 90 semester hours of credit instead of the standard 120. lents in this program must complete all of the requirements for the e-year degree in the semester in which the 90th semester hour is eved.

he requirements for this program are (1) 90 semester hours of credit ed in college courses (that is, the 90-hour requirement may not be re- d by credit earned through examinations); (2) completion of the chosen or-field program and general curricular requirements; (3) grades of *A* in ast 45 semester hours of course work and *no* grades below *C*; (4) at t 60 semester hours of credit earned in 100-level courses; and (5) rec- nendation of the major department or program.

o be eligible for this program, the student must show evidence of ex- ional academic ability by college record, performance in college ses, and other appropriate information.

n interested student should make application directly to the major- departmental chairman or program director as soon as possible, erably by the end of the first year of study. The student's academic rd to that point will, of course, provide a useful criterion of eligibility. transfer student may qualify for graduation under the 90-hour program ided the student completes at least 60 semester hours of the approved our program in Columbian College, earns grades of *A* in no less 45 semester hours of such course work at this University, and has rades below *C*.

student who fails to maintain the required academic performance e studying toward the 90-hour degree program simply continues for tandard 120-hour degree.

Bachelor of Arts

The Bachelor of Arts degree is offered in the following fields:

American Civilization
American Literature
Anthropology
Applied Mathematics
Applied Statistics
Art History
Biology
Botany
Chemistry
Chinese Language and Literature
Classical Archeology and Anthropology
Classical Archeology and Classics
Classical Humanities
Dramatic Art
Early Modern European Studies
Economics
English Literature
Environmental Studies
Fine Arts
French Language and Literature
General Curriculum in the Liberal Arts
Geography
Geology
Germanic Languages and Literatures
History
Journalism
Judaic Studies
Latin American Studies
Mathematical Statistics
Mathematics
Music
Philosophy
Physics
Political Science
Psychology
Radio-Television
Religion
Russian Language and Literature
Russian Literature and Culture—in Translation
Sociology
Spanish-American Literature
Spanish Language and Literature
Speech Communication
Speech Pathology and Audiology
Statistics (Computer Science option)
Zoology

Combined Degrees of Bachelor of Arts and Doctor of Medicine

A candidate for the combined degrees of Bachelor of Arts and Doctor of Medicine must (1) complete the entrance requirements for the Doctor of Medicine degree in the School of Medicine and Health Sciences; (2) complete the general requirements stated on pages 74-75 and 81-82; (3) accumulate 90 semester hours in the liberal arts, including a minimum of [illegible] second-group courses in Columbian College; (4) obtain the approval of the Dean of Columbian College at the time of entering the School of Medicine and Health Sciences; (5) obtain the recommendation of the Vice President for Academic Affairs of the Medical Center at the completion of [illegible] prescribed courses in the first year of the School of Medicine and Health Sciences, at which time the degree of Bachelor of Arts will be conferred (professional work taken at another institution will not satisfy the residence requirement of the combined degrees); (6) maintain throughout the [illegible] course the scholarship level required for graduation.

Bachelor of Science

The Bachelor of Science degree is offered in the following fields:

Applied Mathematics
Applied Statistics
Biology
Botany
Chemistry
Environmental Studies
Geology
Geology (Engineering option)
Mathematical Statistics
Mathematics
Physics
Zoology
Statistics (Computer Science option)

Undergraduate Major

e are two types of undergraduate majors: the Field-of-Study major he Departmental major. Five majors—Classical Archeology and An- ology, Classical Archeology and Classics, Environmental Studies, c Studies, and Latin American Studies—although interdepartmental ture, are governed by the regulations of the Departmental major.

-OF-STUDY MAJOR

Field-of-Study major covers a carefully worked out field of coordi- study and is under the supervision of the appropriate department he Columbian College Committee on Curriculum.

e Field-of-Study major requires no specific program of courses, al- gh the student is required to meet the over-all general requirements ne degree. Ability to pass the Major Examination is assumed to be a incing demonstration that the student possesses the breadth, depth, quality of knowledge of the major usually defined in terms of semester , courses, and grades. Information on each field is obtainable from epartment. Immediately upon declaring a major, students should con- he appropriate department so that they may be assigned an advisor. e Field-of-Study major places special emphasis on the intellectual opment of the individual student. Programs in the same major may depending upon the individual student's background, previous study, ptitudes. The student is expected to consult the advisor frequently, ne special proseminars offered in some fields give the student further tunity for individual advice and direction in pursuing a program ially adapted to individual needs and abilities. A close student- or relationship is essential for the student's success under the of-Study major plan.

following Field-of-Study majors are offered: American Civilization, can Literature, Chinese Language and Literature, English Literature, n Language and Literature, History, Russian Language and Literature, n Literature and Culture—in Translation, Spanish American Litera- Spanish Language and Literature.

eminar in the Major—A proseminar is offered in most fields to help dent acquire a coordinated knowledge of the chosen field through g, study, and laboratory exercises. It is a presentation of the content ethods of the major field as a whole through the organization and nation of the knowledge obtained in the various formal courses in jor subject and of material not usually included in such courses. ourse is not required, but, if it is elected, strict attendance is essen- x semester hours, but no qualitative grade, may be assigned. When red in this course, the student has the privilege of visiting, subject approval of the instructor, any other appropriate course offered in llege. (Regular attendance in a course, either for credit or as an , requires registration and payment of tuition.) Proseminars are ly to the student who has been accepted as a candidate under that major.

Major Examination—The Major Examination will normally be taken lose of the senior year; a student on a limited schedule may take it

no earlier than one calendar year before graduation. A student wh to pass a Major Examination may, at the discretion of the Commit Curriculum, be re-examined at a later regular major-examination The Committee on Curriculum has general supervision of the prepa reading, and grading of Major Examinations. Major Examinations a each semester on dates fixed by the department or departments con but in no case later than December 1 for the fall semester, April 13 spring semester, and August 26 for the summer sessions.

DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in te credit hours, required courses, and the attainment of grades no lowe *C* in the minimum required second-group courses taken in the majo A *D* in a required course will satisfy a curricular requirement in the but it will not count toward the minimum number of hours required major. (A department may require a degree candidate to repeat a re course in which a *D* was received. See page 44.) The minimum s requirements for Departmental majors are listed below the staff of t tion of the department concerned. The chairman of the departme designated departmental advisor, should be consulted at registratio cerning the student's program of courses; and the entire program, inc electives, must be approved by the department. The student is a pected to consult the chairman or advisor in all matters affecting th gram of studies, such as changes, substitutions, or withdrawals, and cially concerning the student's progress in a course. A close st advisor relationship is desirable.

Departmental majors are offered in the following: American Lite Anthropology, Applied Mathematics, Applied Statistics, Art Histo ology, Botany, Chemistry, Classical Archeology and Anthropology departmental), Classical Archeology and Classics (interdepartm Classical Humanities, Dramatic Art, Economics, English Literatur vironmental Studies (interdepartmental), Fine Arts, General Curric the Liberal Arts, Geography, Geology, Geology (engineering option manic Languages and Literatures, History, Journalism, Judaic Stud terdepartmental), Latin American Studies (interdepartmental), matical Statistics, Mathematics, Music, Philosophy, Physics, P Science, Psychology, Radio-Television, Religion, Russian Langua Literature, Sociology, Speech Communication, Speech Pathology a diology, Statistics (computer science option), Zoology.

MINORS

Students who wish to familiarize themselves with a field outside major may graduate with a minor in addition to the major. Not all bian College departments offer undergraduate minors; the requir prescribed by those that do are printed under the name of the depa involved. A student interested in a minor should consult faculty ad in the department concerned and declare both major and minor pr on the appropriate form available in the dean's office.

BLE MAJORS

the prior approval of the departments concerned, a student who pletes the requirements of two major fields in Columbian College (for ple, mathematics and physics, or English and Latin, or history and omics) may graduate with a double major. Such a student should ult with advisors in the two departments concerned and officially re both majors on the appropriate forms available in the dean's e. A double major must be taken in departments offering the same ee (either the B.A. or the B.S.); a major field in Columbian College ot be combined with a major field offered by another degree-granting of the University.

RDISCIPLINARY PROGRAMS

gular Interdisciplinary Programs—Several programs presently exist, ding American Civilization, Classical Archeology and Anthropology, sical Archeology and Classics, Early Modern European Studies, Envi- ental Studies, Judaic Studies, and Latin American Studies.

ecial Interdisciplinary Programs—A student who finds no existing r or program suited to individual educational goals may develop a ial major program, in consultation with appropriate departmental ad- s. Final approval of such a program rests with the Committee on Cur- um. Only programs with valid and clearly defined academic goals will pproved, and each shall be designated by a title suggested by the ent to the Committee on Curriculum for approval. At least 45 semester s of credit of the approved program must be completed in Columbian ge. Because of their broad scope, such interdisciplinary majors may e combined with a double major.

student in an interdisciplinary program will be expected, during the nd semester of the senior year, to take a comprehensive examination er oral or written) in the interdisciplinary field, or to undertake a sen- omprehensive thesis, at the discretion of the student's interdepart- al committee.

ecial Interdisciplinary Courses—Under the supervision of the Com- e on Curriculum, new courses will be offered each semester combining nethods and insights of several disciplines. Interested students should ult the current *Schedule of Classes*, where they will find such courses bered 701 and 721. These courses do not satisfy the requirement of ningful initiation into the three divisions of knowledge (see Columbian ge General Course Requirements).

neral Curriculum in the Liberal Arts—Directed by the Curriculum mittee of Columbian College of Arts and Sciences. The program is gned to provide a general education in the liberal arts, with or without jor, as the student chooses. It offers opportunity for achieving a sub- ial acquaintance with each of the three divisions of knowledge gh a selection of courses that cultivate a broad perspective in time in national and/or cultural traditions. The committee appointed to e students in the program consists of one representative each from umanities, the social sciences, and the natural and mathematical ces. For curriculum requirements, see page 317.

GRADUATE SCHOOL OF ARTS AND SCIENCES

Dean H. Solomon
Assistant Deans A.D. Andrews, E.A. Caress, D.A. Rowley, C.E. Ri

FACULTY AND CONSULTANTS

Faculty*

Professors E. Abravanel, A.V. Adams *(Research)*, L.F. Affronti, E.N.
F.D. Allan, J.G. Allee, Jr., J. Aschheim, D.L. Atkins, J.M. Bailey
Bari, O. Bergmann, S. Bloom, L.S. Bowling, H.F. Bright, A.D. Br
Brown, J.F. Burks, W.E. Caldwell, E.A. Caress, G.V. Carroll
Cassidy, I.H. Cisin, A.G. Coates, V.H. Cohn, T.F. Courtless,
Cunliffe, R.H. Davison, L.G. DePauw, R.M. Dunn, Jr., J. Els
A. Etzioni, S.E. Fabro *(Research)*, N. Filipescu, J.A. Frey, R.N.
J.L. Gastwirth, R.S. Goldfarb, A.L. Goldstein, M. Gordon, S.W.
house, F.S. Grubar, A. Gyorgy, S.E. Haber, R.C. Haskett, P.H.
Jr., P.P. Hill, J.W. Hillis, H.C. Hinton, H.H. Hobbs, M.A. Hol
Hsieh, K. Huang, R. Hugh, R.L. Humphrey, Jr., M.J. Jackson, T.
son, R.G. Jones, H.D. Junghenn, I. Katz, J.W. Kendrick, R.A.
R.W. Kenny, H. Kenyon, Y. Kim, P.D. Kind, J.C. King, A.D. Kir
Klarén, M.J. Koering, R.M. Krulfeld, T.Z. Lavine, H.L. LeBlanc
Lengermann, S. Levitan, B.I. Levy, J.B. Levy, J.F. Lewis, R.K
H.W. Lilliefors, R.C. Lindholm, C.D. Linton, T.P.G. Liverman, J.
don, W.F.E. Long, J.C. Lowe, H.G. Mandel, P. Mazel, G.E. Mazz
Mergen, J.W. Millar, F.N. Miller, J. Miller, C.C. Mondale, J.A. Mo
J.N. Mosél, C.A. Moser, N.N. Natov, D. Nelson, B. Nimer, C.
R.K. Packer, R. Parris, T.P. Perros, V. Petrov, E.L. Phillips,
R.E. Purcell, J.P. Reesing, Jr., B. Reich, M. Reich, C.E. Rice, J.W
L.F. Robinson, H.M. Sachar, B.M. Sapin, S.O. Schiff, R.H. Schla
Schmidt, L.G. Schwoerer, R.P. Sharkey, R.H. Shumway, H. S
F.R. Siegel, G. Sigur, D.E. Silber, B.W. Smith, R.S. Snell, H.
G. Stambuk, J.E. Starrs, C. Steiner, G. Steiner, R.W. Stephe
Stewart, Jr., J.A. Straw, C. Taam, D.H. Teller, K. Thoenelt, R.B
son, R. Thornton, C.S. Tidball, M.E. Tidball, G.V. Vahouny, R.
R.H. Walker, Jr., D.D. Wallace, Jr., R.A. Wallace, S.J. Wa
Weismiller, D.G. White, R.E. Wood, H.B. Yakobson, H.E. Y
A.J. Zuchelli

Adjunct Professors, W.F. Anderson, T.E. Bowman, J.C. Broder
Chace, Jr., R.G. Crystal, R.C. Gallo, D. Gillespie, E.G. Kauffma
Leach, W.H. Lewis, C.G. McWright, C.R. Merril, J.C. Petricci
Pierce, H.A. Rehder, I.G. Sohn, G. Todaro

Associate Professors F.P. Abramson, Y. Al-Doory, A.D. Andre
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J.J. Cordes, C.F. Elliott, R.S. French, C.T. Garrett, H.I. Gates, H.F
Jr., I.I. Glick, V.K. Golla, M.D. Green, W.B. Griffith, R.A. Ha

* The President of the University, the Vice President for Academic Affairs, the Regi
University, the Director of Admissions of the University, and the University Libra
officio members of the Faculty of the Graduate School of Arts and Sciences.

Havrylyshyn, D.R.K. Henney, C.J. Herber, A.J. Hiltebeitel, R.W. Holmtrom, J.O. Horton, T.L. Hufford, C.T. Ireland, K.E. Johnson, W.R. Johnon, S.A. Karp, R.E. Kennedy, S.G. Kent, N.K. Khatcheressian, M. King, . Klubes, R.E. Knowlton, J. Lake, N.T. Lappas, J.W. Larsen, R.A. Lavine, M.P. Lee, D.R. Lehman, C.A. Linden, C.W. Linebaugh, G. Ludlow, J.H. Maddox, H. Merchant, H.R. Nau, S.N. Neftci, G.A. Olkhovsky, T. Ozdogan, W.C. Parke, J.N. Pearce, E.O. Pederson, J.A.A. Plotz, P.J. Poppen, J.A. Quitslund, L.P. Ribuffo, L. Rothblat, W.F. Rowe, D.A. Rowley, P.G. Sáenz, R.M. Scheffler, S.L. Simons, A.H. Smith, C.W. Sten, .A. Stone, M.F. Taragin, I. Thompson, N.A. Tilkens, J.L. Tropea, C.E. Tuthill, **G.A. Walker, D.W. Watkins, J.F. Wright, Jr., A.M. Yezer, R.Y.** Yin, B.C. Zook

Junct Associate Professors E. Kramer, J. Krash, K. Krell, H.Y. Kwiatkowska, D.J. Picciano, M.S. Schanfield, J. Schlom, E. Ulman

sistant Professors J.C. Anderson, R.J. Anderson, I. Azar, S.R. Barnett, .A. Brown, A.R. Bruhn, J.R. Burns, G. Carter, R.L. Combs, C. Costigan, . Cruz-Saenz, C.J. Deering, R.P. Donaldson, R.K. Evans *(Visiting)*, D. ischer, L.L. Gallo, N.C. Garner, S.K. Green, F. Griffith, S. Hashtroudi, . Hitchcock, D.E. Johnson, J.K. Kelleher, J.M. Kerns, M.P. Lader, . McAleavey, C. McClintock, A.L. Mescher, M.R. Metzger, S.B. Molina, .M. Orenstein, P.M. Palmer, G. Paster, K.N. Rosenbaum, O.A. Seavey, .P. Seifert, S. Shaffer, R. Sines, F. Slaby, B.L. Slack-Bean, S.S. Smith, .C. Stephens, P.L. Stewart, G. Stokes, A. Strickland, A.M. Suria, J.M. hibault, B. Von Barghahn, C.A. Wagner, R. Walsh, E.R. Williams, V.T. Woodward

Junct Assistant Professors **E. Bloomfield, S.L. Connelly, J.D. Fife, M.** leming, **W. Maiorana, P.A. Rossiter-Ravenscroft**

n's Council

Solomon *(Chairman)*, **J.F. Burks, P.P. Hill, M.J. Koering, J. B. Levy, A.L.** cher, **S.N. Neftci, F.R. Siegel, D. Wallace, Jr.**

sultants in Research

Adelstein, J. Adkins, E.P. Anderson, A.A. Ansari, R. Asofsky, W. Back, Barnard, J. Bellanti, L. Bilker, E.J. Blanchette-Mackie, L. Bockstahler, Boone, W. Bowman, M.F. Brennan, M. Brightman, S.W. Burks, C.P. cher, C. Carson, K.J. Catt, K. Chang, M.A. Chirigos, J.Y. Cole, Jr., Collette, R.E. Darcy, C. Dawe, J. Farrar, M.R.S. Fox, J.E. Fredland, Freese, R.M. Friedman, J.D. Gardner, R. Gibbs, Jr., F.R. Goff, J. Goldn, R. Goldstein, J. Granger, G. Guroff, G. Hager, J. Hardt, R. Harmon, Hazel, R. Herberman, P.N. Herbert, G. Hodgen, J.M. Holmes, L. Horton, loubrick, T. Hunt, D. Jacobowitz, M.L. Jones, S. Jong, R.K. Kahn, M.W. nz, F.M. Kregenow, L.P. Leite, L.S. Lessin, R. Levy, M.E. Lippman, iu, D.R. Livengood, D.L. Loriaux, W.M. Lovenberg, P. Lundeberg, W. low, R. Mage, C.R. Manclark, R.W. Manderscheid, S.R. Mazzur, B.F. ker, J.L. Middlebrook, M. Mishkin, J. Mitchell, B.R. Murphy, W.G. h, J.C. Osborne, Jr., D.B. Parsons, A. Peacock, J. Pisano, J.W. Porter, . Pratt, Jr., A. Raskin, W.D. Rasmussen, G.S. Roth, A.N. Schechter, Schmidt, L.P. Schultz, D. Segal, R.S. Sigafoos, L.B. Smith, L. Sokoloff,

M.B. Sporn, T.C. Stadtman, J.R. Stephenson, S. Stewart, K.L. Storrs, Tabor, H. Tabor, J.F. Tallman, R. Ting, R.W. Wannemacher, Jr., W.E. burn, R.L. Weintraub, S.H. Weitzman, J.R. Williams

Field of Studies Consultants

D. Ari, R.V. Allen, T. Bower, I. Breger, J. Carr, G. Evans, J. Fed A. Fern, J. Flint, J. Fulton, S. Hobbs, H.J. Hogan, A. Jabbour, J.B. K A. MacTavish, V. McKay, E. Myette, J.N. Norris IV, J.C. Osborne, Jr Rand, N.L. Sass, S.I. Shibko, J.W. Witherell

HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for adv study and research leading to Master's degrees in the arts and sci and the degree of Doctor of Philosophy. Graduate programs at G Washington University were first formally organized under the Gra School in 1905, following several decades of gradual growth in a nu of departments. In 1930 the Graduate School was discontinued. Colu College, the University's liberal arts college, then assumed respons for the Master of Arts and Master of Science degrees, and a newly cr Graduate Council administered all Doctor of Philosophy programs. fessional schools took responsibility for advanced degrees in the p sional fields.

In 1967 the Graduate Council and the Graduate Division of Colu College were consolidated into a new Graduate School of Art Sciences. All graduate programs in the arts and sciences leading degrees of Master of Arts, Master of Arts in Special Studies, Mas Fine Arts, Master of Forensic Sciences, Master of Music, Master o ence, Master of Science for Teachers, Master of Science in Fo Science, Master of Science in Special Studies, and Doctor of Philo are under the Graduate School.

In addition, a Master of Philosophy degree is awarded by the S upon recommendation of the appropriate department, to students have successfully completed the General Examination for the Doc Philosophy degree.

The School is under the direction of the Graduate Faculty of Ar Sciences. It is the responsibility of the Faculty to set the requireme admission to the School, to provide courses and programs of stud research for its students, to establish academic standards for its de to recommend to the Board of Trustees the awarding of degrees, down regulations as needed for the operation of the School, and ge to supervise its activities.

The administration of the School is vested in the dean, who is ch of the Dean's Council, which is responsible to the Faculty of the for all policy matters.

ADMISSION REQUIREMENTS

Application forms for admission to graduate study are obtained fr Office of the Dean of the Graduate School of Arts and Sciences. completed, these application forms must be submitted to this off

er with college transcripts and letters of reference, and other informa-
as required by the department or program. Admission is dependent on
artmental recommendation and approval by the dean.

pplicants must have academic backgrounds of excellence, usually with
ors, or equivalent, in the fields in which they intend to study for ad-
ced degrees. Normally, a *B* average (or equivalent) from an accredited
ege is required. With evidence of special promise, such as high Gradu-
Record Examination scores, an applicant may be accepted whose
demic record falls short of *B*. The minimum does not assure automatic
eptance. The departments may, and often do, set higher admission
dards. Moreover, the number of spaces available for new graduate
lents limits the number that can be accepted. Students who apply in
r senior year must have completed their baccalaureate work before
stration in the Graduate School and must present evidence of such
pletion. Students whose native language is not English are required to
the *Test of English as a Foreign Language* (TOEFL), administered by
Educational Testing Service, Princeton, N.J. (see pages 25-26).

pplication for Admission—Applicants who are requesting fellowship
port must submit completed applications by February 15 (February 1
students in clinical psychology and art therapy) for admission in the
semester and by November 1 for admission in the spring semester.
licants for the on-campus Master of Arts in Special Studies must have
application materials in the Graduate School Office by July 15 for the
semester, November 1 for the spring semester, and April 15 for the
mer sessions. Applications for graduate study without fellowship sup-
made after these dates are acceptable for admission in the corre-
nding semester and will be reviewed if time permits and if space is
lable in the program desired. More time than normal may be required
process applications submitted during June, July, and August.

eadmission—A student who wishes to resume a graduate program
ch had been interrupted, must file an application form to be considered
readmission. Readmission is not guaranteed, and the application is
ject to review by the department concerned and the dean. The student
be required to take qualifying examinations on the course work
pleted. Application forms are available in the Graduate School Office.

GULATIONS

ulations regarding admission, registration, fees, and finances are stated
ages 20-32; other University regulations, on pages 44-52.

addition, the Graduate School publishes a Student Handbook each
demic year which contains updated information on the School's
cies, regulations, and other matters of concern to enrolled or admitted
lents. It is the responsibility of the student to be aware of the informa-
contained in this *Bulletin* and the Handbook.

des

des for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*,
; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure,
uthorized Withdrawal; *CR*, Credit.

he symbol *I* (Incomplete) indicates that a satisfactory explanation has

been given to the instructor for the student's failure to complete t
quired work for a course. The "Incomplete" must be made up befo
lapse of one calendar year. An "Incomplete" for regular course work
is not removed within one calendar year remains permanently as a
of *I* on the student's record. The grade of *I* cannot be removed by r
tering for the course here, or by taking its equivalent elsewhere.

The grade of *I* is also given for all thesis and dissertation re
courses until the thesis or dissertation is completed. Upon the satisf
completion of the thesis or dissertation the grade *I* is changed
automatically. The grade of *CR* is given for an *Advanced Readi*
Research (usually numbered 398) course.

Scholarship Requirements

Graduate students are required to maintain a minimum accumulative
average of *B* (3.00) in all course work taken following admission
Graduate School. Individual departments may require a higher s
The fields of art history, English, and psychology require a 3.25 a
If the required grade average is at any time not maintained, the st
degree candidacy is subject to termination.

In the case of a student who receives a grade of *F* for a course
program of studies, the Graduate School will require a written sta
from the department justifying the student's continuance in the Gr
School and outlining the program to be followed. Continuation is con
upon the dean's approval. When a grade of *F* is received for a co
the program of studies, the grade is included in the student's grad
average whether or not the course is repeated.

A student may repeat for credit a course in which a grade of *C* o
was received only when permitted to do so by the department con
unless the course description states that the course may be repea
credit. A written statement to this effect must be submitted for appr
the dean's office by the appropriate departmental advisor. It is th
with the Registrar. If a course is repeated for credit, the first gr
ceived remains on the student's record and is included in the st
grade point average.

A graduate student may take an advanced undergraduate course (
numbered 101-200) for graduate credit only upon the approval of t
and the department at the time of registration. Such approval is
only with the provision that the student complete additional work f
to receive graduate credit.

Program of Studies

The program of studies must be approved by the dean and the
mental advisor and filed in the Graduate School Office no lat
November 1 for graduate students entering in the fall semester, or
15 for graduate students entering in the spring semester. A prog
studies may be revised, when necessary, by obtaining the approva
departmental advisor and the dean. The revision must be filed
Graduate School Office. A completed course cannot be droppe
the program of studies unless it is due to an error in advisin

inistrative error. Such a change in the program requires the approval of dean.

tinuous Enrollment

students must be continuously enrolled while working toward a ee, except during the summer sessions. If continuous enrollment is maintained, the student is dropped from the degree program unless ve of absence is granted by the Graduate School.

laster's candidates should meet the calendar deadline for completing degree as specified in the program of studies. If the deadline is not assuming academic approval for an extension which may be granted xceptional circumstances, the student must register and pay for six lit hours of "Reading and Research" each semester.

octoral students in the first unit of their programs shall meet the ndar deadline for completing this unit as specified in the program tudies. Completion of the first unit includes satisfactory completion course work, tool requirements, and the General Examination. If deadline is not met, assuming academic approval for an extension ch may be granted in exceptional circumstances, the student must ster and pay for six semester hours of "Reading and Research" each ester. These hours will not be credited toward completion of the ee. Doctoral students in the second unit of their programs, i.e., dissern research, should complete this unit as specified in the program of ies. If the deadline is not met, assuming academic approval for an nsion which may be granted in exceptional circumstances, the student t register and pay for six semester hours of "Reading and Research" n semester.

ve of Absence

tudent who is temporarily unable to continue the program of studies request leave of absence for a specific period of time, not to exceed calendar year during the total period of degree candidacy. When period of leave has expired, it is the student's responsibility to fy the Graduate School at least two months in advance of a given stration period of intention to reregister. If a student fails to re-register, candidacy is terminated.

hdrawal

duate students who intend to withdraw from the Graduate School uld inform the School in writing. The last day for *complete* withdrawal hout academic penalty is at the end of the eighth week of classes.

duation Requirements

students must file an Application for Graduation and pay the reed graduation fee at the time of registration for the last semester or mer session of the final year in which they intend to graduate. Students t be registered in the Graduate School during the semester they plan to uate. Master's and doctoral candidates may graduate in May, February, eptember. Students who have completed the requirements for a degree

but have not yet been awarded the degree will be issued a letter
effect upon request.

DEGREES

Listed below are the degree programs of the Graduate School of A
Sciences and the specific degrees offered, by field. The programs
rected by the departments concerned. Degree programs which brid
or more departments are directed by committees composed of me
of the departments concerned. For further information write to th
or the chairman of the appropriate department.

The degrees of Master of Arts in Special Studies and Master of S
in Special Studies are designed for students who do not wish to c
trate in a specific discipline. The Graduate School of Arts and S
offers programs on campus leading to the degree of Master of
Special Studies with concentration in Crime in Commerce, Criminal
Gerontology, Women's Studies, and Philosophy and Social Policy.

Students with special academic goals may pursue individualize
grams of study toward the M.A. or M.S. in Special Studies sub
approval by the Committee on Individual Programs and the dean. C
must be drawn from a minimum of three fields, with a maxim
18 hours from any one field. A majority of courses must be taken
the Graduate School of Arts and Sciences. Also required is a one-se
colloquium on interdisciplinary methods. The nature of the compreh
examination is a final essay in which the integration of the prog
study is demonstrated. The School also offers Master of Arts in
Studies and Master of Science in Special Studies degrees in
academic areas at off-campus locations (see page 103).

Graduate Fields

The graduate course work offered in support of the degree progr
the following list is shown by department in this catalogue.

	Degrees
I. Humanities	
American Civilization	M.A.
American Literature	M.A.
Art:	M.F.A.
Ceramics	
Design	
Graphics	
Painting	
Photography	
Sculpture	
Visual Communication	
Art History	M.A.
Classical Archeology, Classics and History	M.A.
Dramatic Art	M.F.A.
English Literature	M.A.
*French Literature	M.A.
Germanic Languages and Literatures	M.A.

*Any approved combination of French, Spanish, or Spanish-American Literature is avai
a Doctor of Philosophy field

History of Religions—Hinduism	M.A.	
Museum Studies	M.A.	
Music:	Mus.M.	
Applied Music		
Composition		
Conducting		
Music Theory		
Musicology	M.A.	
Philosophy	M.A.	
Religion	M.A.	
Religion and Medical Care	M.A.	
Religious Education	M.A.	
Russian Language and Literature	M.A.	
Spanish-American Literature	M.A.	Ph.D.
Spanish Literature	M.A.	Ph.D.

Social Sciences

Anthropology	M.A.	
Economics	M.A.	Ph.D.
Education Policy		Ph.D.
Geography	M.A.	
History	M.A.	Ph.D.
International Relations		Ph.D.
Political Science	M.A.	Ph.D.
Sociology	M.A.	Ph.D.

Physical and Mathematical Sciences

Applied Mathematics	M.A., M.S.	
Applied Statistics	M.S.	
Chemistry	M.S.	Ph.D.
Engineering Geology	M.S.	
Forensic Sciences	M.F.S., M.S.F.S.	
Geochemistry	M.S.	Ph.D.
Geology	M.S.	Ph.D.
Mathematical Statistics	M.A.	Ph.D.
Mathematics	M.S. for Teachers, M.A.	Ph.D.
Physics	M.A.	Ph.D.

Biomedical and Related Sciences

Anatomy		Ph.D.
Art Therapy	M.A.	
Biochemistry	M.S.	Ph.D.
Biological Sciences	M.S.	Ph.D.
Genetics	M.S.	Ph.D.
Microbiology	M.S.	Ph.D.
Pathology		Ph.D.
Pharmacology	M.S.	Ph.D.
Physiology	M.S.	Ph.D.
Psychology	M.A.	Ph.D.
Radiological Sciences		Ph.D.
Speech-Language Pathology and Audiology	M.A.	

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approved combination of French, Spanish, or Spanish-American Literature is available as ctor of Philosophy field.

School of Public and International Affairs offers a Master of Arts field in International s.

logy, botany, and zoology

Combined Master of Science and Doctor of Medicine Degrees

Students interested in the combined degrees of Master of Science Doctor of Medicine must meet the requirements for admission to Graduate School of Arts and Sciences and to the Doctor of Medicine gree program of the School of Medicine and Health Sciences.

The Master of Science program consists of a minimum of 30 sem hours of credit and the fulfilling of the tool requirement (see pag A maximum of 12 semester hours of credit for graduate-level courses *pleted as a part of the Doctor of Medicine degree curriculum* (an already applied toward the bachelor's degree) will be allowed in ment of the requirements of the Master of Science degree. The rem 18 semester hours of work, which in most programs incudes a thesis, be work in the basic medical sciences normally required for a Mas Science degree in the Graduate School of Arts and Sciences.

Joint Master's–Juris Doctor Program

Students interested in working concurrently toward the Juris Doct gree in the National Law Center and a master's degree in the Gra School of Arts and Sciences must meet the requirements for admiss both schools and all requirements in each degree program. It is po for a student to complete work for both degree programs within four

Dual Program for Doctor of Medicine and Doctor of Philosophy Degre

A dual program is available to qualified students who seek both the of Medicine and Doctor of Philosophy degrees. The requirements must be fulfilled for both degrees are identical to those currentl separately established in the School of Medicine and Health Scienc the Graduate School of Arts and Sciences.

A student working toward these degrees may apply a maximum semester hours of approved course work in the School of Medicin Health Sciences toward the minimum of 48 hours of course work re to qualify for the General or Cumulative Examination for doctoral c dacy. This course work is normally taken during the semesters that nate with the medical program and in the years following the awa the M.D. degree. The student's research for the dissertation may concurrently with the final 24 semester hours of graduate course leading to the General or Cumulative Examination. The estimated for the completion of this dual program is six years.

In order to enter the dual degree program, a prospective studen must apply for and gain admission to both the Graduate School of Ar Sciences and the School of Medicine and Health Sciences sepa through established procedures. Upon admission to both school student may then apply for affiliation with the dual degree program. toward the Doctor of Philosophy degree is performed under the ju tion of a departmental doctoral committee.

REQUIREMENTS FOR THE DEGREES

The Master's Programs

Unless otherwise specified, the requirements listed below are app

andidates for the degrees of Master of Arts, Master of Arts in Special lies, Master of Fine Arts, Master of Forensic Sciences, Master of ic, Master of Science, Master of Science for Teachers, Master of nce in Forensic Science, and Master of Science in Special Studies.

General Requirements—For a master's degree program including a is, the satisfactory completion of a minimum of 30 semester hours of roved graduate work, including six semester hours of thesis research, equired. For a master's degree program which does not include a is, the number of semester hours of approved graduate course work is rmined by the department, and normally consists of from 30 to 36 ester hours. The program without the thesis is not an individual stu- t option and is not available in every department. Departments can often do set requirements above the minimum required by the Gradu- School. The program of study leading to the degree of Master of Arts pecial Studies or Master of Science in Special Studies consists of 36 ester hours of approved graduate course work and does not require a is.

Work taken to make up deficiencies is never counted as part of the irements leading to a master's degree. Upon approval, up to one-half he required graduate work may be taken in courses offered by the r affiliated institutions of the Consortium of Universities of the Wash- on Metropolitan Area, Inc., or by another degree-granting division of University. If credit is transferred from another institution (see ansfer of Credit," below), the number of semester hours which may aken at an affiliated Consortium institution is reduced by the number ours accepted as transfer credit.

ll master's degree candidates must complete degree requirements in four years. Extensions beyond this time period require approval written request based on specific and temporary interfering circum- ces.

Academic Work Load—Full-time students register for nine to 12 se- ter hours each semester; part-time students must register for six se- ter hours each semester. These requirements do not apply to students have fewer than nine semester hours (full-time) or six semester hours t-time) remaining to complete their programs. No more than 15 ester hours may be taken during any one semester.

Transfer of Credit—A maximum of one-quarter of the semester hours raduate course work required for a degree may be approved for trans- to the Graduate School from the Division of University Students, an- r degree-granting division of this University, or another accredited ege or university. For a transfer of credit to be approved *all* of the owing conditions must be met: the course work must have been taken r to admission to the Graduate School, it must be approved as part of student's program of studies, it must not have been applied to the pletion of requirements for another degree, it must be post-baccalau- e graduate-level course work, it must have been taken within the past years, and the student must have received a grade of *B* or better in course for which a transfer of credit is requested. This action must made in writing and approved by the departmental advisor and the

dean. A transcript of the course work must be on file before the r can be considered.

4. *Tool Requirement*—Candidates for the degrees of Master of A the field of art therapy, Master of Arts in Special Studies, Master o in the field of speech pathology and audiology (nonthesis option), M of Forensic Sciences, Master of Music, Master of Science in Fo Sciences, and Master of Science in Special Studies; candidates for ma degrees in the Department of Mathematics; and candidates for the of Master of Fine Arts in the field of dramatic art need not fu tool requirement. Master's candidates normally must successfully co a tool requirement in a foreign language, mathematics, statistics, or puter programming, or by graduate course work outside the major d ment (see option [c] below). In place of a tool requirement, candidat the degree of Master of Fine Arts in the fields of ceramics, design, gra painting, photography, or sculpture will complete a methods selected by the Department of Art.

The tool requirement examination should be passed prior to the ning of the third semester of graduate work; students who have no filled this requirement must register for the appropriate course beginning of the third semester. Students who elect graduate course outside the major department in order to fulfill the tool requirement complete this course work before taking the comprehensive exami or undertaking thesis work. Courses taken to satisfy the tool re ment usually cannot be counted in the semester-hour requirement fo master's degree. No master's candidate may attempt a tool exami more than three times. A tool requirement fulfilled at another un cannot be used to fulfill the requirement at this University.

With the approval of the department directing the student's pr of study, the tool requirement may be selected from the following op

(a) Passing a foreign language reading examination (a student register for the appropriate reading course for nonmajors or make ar ments with the appropriate department to take the examination scheduled dates). A student majoring in a foreign language may not that language to satisfy this requirement. English may not be elected tool requirement.

(b) Completing a course in mathematics, statistics, or computer pr ming which is approved by the appropriate department and by the ate School; or passing a special examination covering the approved material, administered by the appropriate department, at the level final examination.

(c) Completing with a grade of B or better a minimum of six se hours of graduate course work in a department other than the stu major department. Three semester hours of this course work will counted toward the minimum semester-hour requirement of the st degree program.

5. *The Thesis*—The main purpose of a master's thesis is to demo the student's ability to make independent use of information and ing, and to furnish objective evidence of constructive powers in a field. The student registers for six semester hours of thesis researc must complete the thesis no later than four calendar years aft

registration. Registration for thesis research entitles the student advice and direction of the member of the faculty under whom hesis is to be written. The thesis subject must be approved by the y member who will be directing the thesis. The thesis, in its final with one copy and a certificate of approval signed by the thesis di- and by at least one departmental reader, must be presented to the no later than the date announced in the University Calendar. All s must meet the form, style, and other requirements set forth in a hlet, *Information Concerning Theses and Dissertations*, available in ffice of the Dean.

Master's Comprehensive Examination—Most master's degree candi- must pass a Master's Comprehensive Examination in the major sub- Examinations are held on dates fixed by the departments, so that ts can be filed in the Graduate School Office no later than the day e the faculty meets to approve the list of graduates. The nature and of the examination is the responsibility of the department or program. student who fails to pass the Master's Comprehensive Examination in exceptional circumstances, and with the approval of the depart- and the dean, repeat the examination at the next scheduled examina- date. If the student fails a second time, no further opportunity to take examination is permitted.

Doctor of Philosophy Program

minimum requirements for the doctoral program are as follows:

General Requirements—The program leading to the degree of Doctor hilosophy requires the satisfactory completion of a minimum of 72 ester hours of approved graduate work for entering students whose est earned degree is a baccalaureate. A minimum of 48 of these hours t be taken in preparation for the General Examination. Entering stu- ts whose highest earned degree is a master's degree are required to ster for a minimum of 48 semester hours of approved graduate work, fewer than 24 of which must be taken in preparation for the General mination. While completing the dissertation portion of the program, student must register for 12 to 24 semester hours of dissertation re- rch, depending on the number of hours completed prior to the General mination. The exact number of semester hours required for any part he total program is assigned by each department and may exceed the imum required by the Graduate School.

Academic Work Load—Full-time students register for nine to 12 ester hours each semester; part-time students must register for six ester hours each semester. These requirements do not apply to stu- ts who have fewer than nine semester hours (full-time) or six semester rs (part-time) remaining to complete their programs.

Transfer of Credit—Entering students who do not hold a master's de- may request transfer of up to 24 semester hours of credit toward a toral degree for acceptable post-baccalaureate graduate work taken at master's degree level at George Washington University or another ac- dited college or university.

Tool Requirements—As early as possible, and before completion of General Examination, the tool requirements specified in the program

of study must be completed. Various options are available for fulfill
tool requirements: each department may permit certain options
others, and all individual choices of tool options must have the appr
the student's department and of the Graduate School. Options for f
tool requirements are as follows:

(a) Two foreign language reading examinations. English may
elected as a tool requirement.

(b) High-level proficiency in one foreign language.

(c) Substitution for one foreign language reading examination
examination, conducted by the appropriate department, in mathe
statistics, or computer science. An examination in a graduate course
University may satisfy this requirement.

(d) Substitution of certain graduate course work as follows: a mi
of six semester hours, completed with grades of B or better, in a
ment other than the student's major department, in place of one
language reading examination. Certain departments may permit
(c) and (d) in place of both foreign language reading examinations;
departments, as well, may permit 12 hours of graduate course work
other department to satisfy the tool requirement.

Students permitted to elect options (a) or (c) above who enter the
uate School with a bachelor's degree must satisfy the first tool requi
before completion of 15 semester hours of course work; students e
with a master's degree must satisfy the first tool requirement n
than the second semester of registration as a candidate for the
of Philosophy degree. Courses taken to fulfill the tool requirement
options (a), (b), and (c), and three of the semester hours' credit
under option (d) (six if option [d] is permitted in place of both
language reading examinations) will not be counted toward the mi
semester hour requirement for the degree.

Further information regarding the various tool requirements i
in the Graduate School's *Student Handbook*.

5. *The General Examination*—Each student is required to compl
General Examination no later than the semester following the com
of course requirements. The General Examination is composed
written examination five to six hours in length in each of the areas o
comprising the student's total program; the time permitted betwe
examination is determined by the administering department. So
partments permit one or two areas of study to be "written off"; th
special, shorter examination is given after a year of course work
area. A cumulative examination system is in effect in the fields o
istry and physiology, and in the field of psychology a system of tw
prehensive examinations is used. Students in these fields should
the appropriate department for information about its system.

A student who fails to pass any part of the General Examinatio
in exceptional circumstances, and with the approval of the dep
and the dean, repeat the examination at the next scheduled exam
date. If the student fails a second time, no further opportunity to
examination is permitted.

Satisfactory performance on the General Examination is requi
admission to the second stage of candidacy for the Doctor of Ph
degree, consisting of the dissertation and final examination. Adm

he second stage of candidacy is permitted only if the student's General mination committee finds that the student's performance on the examion and in course work gives a good indication of success in the second e. Passing of comprehensive examinations at the minimum level does necessarily give this indication.

The Degree of Master of Philosophy—Upon departmental recommenon and approval of the dean, the degree of Master of Philosophy may warded to students who have successfully completed all requirements the Doctor of Philosophy degree up to and including the General Examion. Not all departments recommend students for this degree.

The Dissertation and Final Examination—A dissertation is required of doctoral candidate as evidence of ability to perform scholarly rech and interpret its results. The candidate normally enrolls for *Disation Research* upon completion of the General Examination; however, candidate may register for up to six semester hours of *Dissertation* earch during the time the General Examination is being completed. he dissertation is not completed within five years from the date General Examination is completed, the student will be required to ke the General Examination.

o later than the date specified in the University Calendar, the candidate t submit to the dean the original and one copy of the dissertation and abstract for inclusion in the Announcement of the Final Examination for reproduction by University Microfilms, Inc.

When the dissertation has been approved by the director, two members he Doctoral Program Committee, and the dean, the candidate takes Final Examination, an oral examination which is open to the public. A mittee of examiners (composed of Graduate School faculty and, when ropriate, outside scholars) conducts the examination. A sufficient num- of copies of the dissertation must be provided by the candidate for the nbers of the Examination Committee. If the candidate passes, he or is recommended by the Graduate School for the degree of Doctor of osophy.

etailed information regarding regulations for the form and reproduction he dissertation is available in the Office of the Dean. The successful didate for the doctorate is required, before receiving the degree, to a fee to cover the expense of printing the Announcement of the Final mination, and for the basic service rendered by University Micros, Inc.

LOWSHIPS AND FINANCIAL AID

imited number of graduate teaching assistantships and University owships are available in most departments of instruction to students stered in the Graduate School of Arts and Sciences. A limited number ther kinds of sponsored and University awards are also available. tudents applying for admission who also wish to apply for a fellow- should submit the fellowship application and the application for ission by February 15; the necessary transcripts, Graduate Record mination scores, and letters of recommendation should also be on file his date. Students currently enrolled in the Graduate School should

submit only the fellowship application and have current letters of
mendation on file by February 15.

Forms are available at the Office of the Graduate School of A
Sciences. Filing the fellowship application entitles the student
sideration for all awards available in the student's department.

Students who wish to apply for loans should indicate their inte
so on the application for admission. Information concerning loans
tained in a booklet, *Student Financial Aid*, available from the Univ
Student Financial Aid Office.

COOPERATIVE PROGRAMS

The American Studies Program at George Washington Unive
affiliated with the American Studies Program of the Smithsonian
tion. This arrangement offers students in the field of American
tion an opportunity to take advantage of the Washington envir
Members of the staffs of the Smithsonian's American Studies P
Museum of History and Technology, National Portrait Gallery,
tional Collection of Fine Arts offer seminars and tutorial instru
fields which provide students with an unusual opportunity to devel
dimensions in the discipline of American civilization. This prog
study is open to students working toward the degrees of Master
and Doctor of Philosophy, and is intended to prepare them for r
teaching, and museum-related careers.

The Art Department of George Washington University and the
sonian Institution offer a joint graduate program of study and rese
museum studies leading to the degree of Master of Arts in the
Art History with a concentration in Museum Training. The Dep
has also established a program of study in affiliation with the C
Gallery of Art, the Freer Gallery, the Hirshhorn Museum and Sc
Garden, the Museum of African Art, the National Collection of Fin
the Phillips Collection, the Renwick Gallery, and the Textile Muse

A program of study leading to the degree of Doctor of Philos
American Civilization with emphasis on library research and collec
offered jointly by George Washington University and the Library
gress. The coordinator of the Library Program and the staff offer a
tation seminar and other courses and supervise students in readi
research and in work on such library problems as indexing, catal
and bibliography.

For further information concerning these programs contact one
following offices at George Washington University: the Graduate
of Arts and Sciences for those who are interested in any of the field
above, the Art Department for those interested in art museum train
American Studies Program for those interested in the field of A
civilization.

George Washington University, in cooperation with two oth
versities and the Folger Shakespeare Library, helped establish the
Institute for Renaissance and 18th-century Studies as a cooperati
ture in graduate studies in the humanities. Fifteen universities a
member institutions. Seminars (limited to 12 students each) are
each semester under the direction of American and foreign schola

ger Library forms the core of the Institute. All participants enrolled in seminars are granted access to the collections of rare books, manuipts, and reference materials of the Library. There are also opportuni- for participants to form contacts with the Fellows and readers at the rary, in the process of their research. All registered students are eligible pply for admission to one or more of the seminars, although priority nrollment will be accorded graduate students working on dissertations postdoctoral scholars from the sponsoring institutions.

urther information, including a listing of seminar topics, is available he Office of the Graduate School of Arts and Sciences or at the Folger kespeare Library.

he University and the National Bureau of Standards have entered into ooperative agreement to further educational opportunity at both the versity and the Bureau. This arrangement holds promise for graduate dy and research, with emphasis in the physical sciences.

CIAL OFF-CAMPUS DEGREE PROGRAMS

Graduate School of Arts and Sciences is currently offering the fol- ing special degree programs off campus: (1) the degree of Master of s in Special Studies with areas of concentration in Criminal Justice, rgy Policy, Legislative Affairs, Regulatory Policy, Social and Organiza- al Behavior, and Urban Learning; (2) the degree of Master of Forensic nce; and (3) the degree of Master of Science in Special Studies with as of concentration in Employment Policy, Environmental Science, Oral logy, Social and Economic Statistics, and Telecommunication Opera- ns.

he Graduate School has academic jurisdiction over these off-campus grams which are administered by the College of General Studies. Not of these programs may be available in any given year. For details sult the Graduate School of Arts and Sciences.

HOOL OF EDUCATION AND UMAN DEVELOPMENT

n E.W. Kelly, Jr.
istant Dean R.E. Baker
ecutive Assistant to the Dean L.H. Kornhauser

CULTY*

fessors J.G. Allee, Jr., R.E. Baker, J.G. Boswell, P. Botwin, J.L. Breen, M. Brenner, F.J. Brown *(Visiting)*, M.E. Coleman, R.S. Cottrell, Jr., L.H. Elliott, R.J. Frankie, D. Hawkins, R.K. Ives, S. Kavruck *(Visiting)*, E.W. Kelly, Jr., E.P. Kulawiec, D. Linkowski, A. Marinaccio, M. McIntyre,

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the School of Education and Human Development.

D.A. Moore, L. Nadler, S.R. Paratore, M.N. Rashid, J.E. Sno
L.M. Stallings, R. Tillman, C.E. Vontress, L. Winkler

Adjunct Professor D.C. Paup

Associate Professors M. Burns, M.S. Castleberry, A.L. Dickerso
search), J.W. Fleck, L.H. George, J.A. Greenberg, J.C. Heddesh
G.L. Horrworth, B.E. Peters *(Research)*, R.I. Peterson, J.R. Shotel
Smith, G.D. Wiggs, M.R. Withers

Assistant Professors J.R. Blank *(Research)*, R.N. Ianacone, N.D. J
R.A. Luke *(Visiting)*, A.J. Mazur *(Research)*, H. Nashman, N.J.S
N. Tiscione, L.A. Tsantis

Adjunct Assistant Professor J. Noel

Research Instructors M.B. Freund, A.H. Macomber, A.H. Morris, D.C
C.B. Stapp

Members of the Advanced Graduate Faculty

R.E. Baker, J.G. Boswell, P. Botwin, J.L. Breen, M. Brenner, F.J.
M. Burns, M.S. Castleberry, R.S. Cottrell, Jr., A.L. Dickerson, L.H.
J.W. Fleck, R.J. Frankie, J.A. Greenberg, D. Hawkins, J.C. Heddeshel
Horrworth, R.N. Ianacone, R.K. Ives, S. Kavruck, E.W. Kelly,
Kulawiec, D. Linkowski, R.A. Luke, A. Marinaccio, A.J. Mazur, D.A.
L. Nadler, S.R. Paratore, D.C. Paup, R.I. Peterson, M.N. Rashid, J.R.
G.W. Smith, J.E. Snodgrass, N.J.S. Sobel, L.M. Stallings, R. Tillma
Tsantis, C.E. Vontress, G.D. Wiggs, L. Winkler

Committees*

EXECUTIVE COMMITTEE

J.W. Fleck *(Chairman)*, J.L. Breen, R.S. Cottrell, J.C. Heddeshel
Linkowski, M.N. Rashid

CURRICULUM COMMITTEE

F.J. Brown *(Chairman)*, D. Hawkins, R.K. Ives, R.A. Luke, M. M
L.M. Stallings

FACULTY COMMITTEE

F.J. Brown, J.A. Greenberg, D.C. Park, J.R. Shotel, L.M. Stalling
Wiggs

SCHOOL, COMMUNITY, AND ALUMNI AFFAIRS COMMITTEE

A.J. Mazur *(Chairman)*, L.H. George, D. Linkowski, L. Winkler

STUDENT COMMITTEE

M. Burns, N.D. Johnson, H. Nashman, L.A. Tsantis

INTRODUCTION

The University began offering professional courses for teachers in
and in 1907 it established a Division of Education. In 1909 the Divi

* The dean and the assistant dean of the School of Education and Human Develop
ex *officio* members of all committees

tion became the Teachers College which in its early years was con-
largely with teacher preparation on the undergraduate level.
928 the Teachers College became the School of Education and greater
ion was made for advanced study. Since that time the graduate en-
nt has steadily increased, with the result that today the School has a
erably larger number of graduate than undergraduate students. To
the current scope of its offerings, the name of the School was
ed in 1977 to the School of Education and Human Development.

School of Education and Human Development prepares teachers,
ce and support personnel, and administrators for educational service.
chool also offers opportunities to experienced teachers to extend
rich their education. The programs are designed to meet the broad
of all persons who seek the knowledge and skills necessary to pro-
or effective learning and teaching. The School's programs focus on
eds of persons interested in the traditional elementary and second-
hool environments, but also include the preparation of individuals
areas of education covering the life span from pre-school through
ult years in both the public and private sectors of society. The
ing graduate programs are representative: Adult Education, College
nt Development, Dance, Early Childhood Education and Early Child-
Special Education, Generic Counseling, Gifted and Talented, Higher
tion, Human Resource Development, Individualized Master's, Liaison
l Educator, Perceptual Motor Development, Rehabilitation Counsel-
herapeutic Recreation, Tourism Development and Travel Adminis-
, Vocational/Special Education.

achelor of Arts in Education and Human Development is more than
ation for teaching in schools. The degree provides background and
ences for careers in a variety of public and private settings. A
ty of the credit hours of required courses are in the liberal arts. In
on, the programs provide opportunities for students to develop
l thinking and reasoning, as well as leadership, organizational, and
ng skills. Emphasis is placed upon developing the human relation-
ualities that are essential in fields that require involvement with
in all age ranges and from all walks of life.

School of Education and Human Development is the administrative
or three departments: Education, Human Kinetics and Leisure
s, and Special Education. In addition to programs of study leading
degrees, the School offers credit and non-credit workshops designed
cally to meet the unique needs of metropolitan area school systems,
her clienteles in private industry and in government.

cial curricula are tailored on an individual basis for liberal arts
tes and graduates of other professional schools who are interested
hing or in other human services areas. The School also offers a wide
of courses for teachers who wish to renew licenses and for pro-
al teachers who wish to prepare for teaching certificates.

oratory and clinical facilities are provided by the University Reading
. Field experiences are provided in cooperation with public and
e schools, social agencies, museums, institutions in the business
unity, and community and junior colleges.

schedule of courses is arranged to meet the convenience of both
ne and part-time students.

Professional Courses for Non-Education Majors

Columbian College students in a number of major fields are per use their electives to complete all of the professional education required for teaching in middle schools and junior and senior high Students interested in taking these courses should contact the the dean of the School of Education and Human Development.

Freshmen and sophomore students may take professional e courses that include field work experiences. Some of these cours it possible for students who are undecided about their choice of to have an opportunity to test teaching and some of the many helping services areas.

A number of professional education courses are open to non-e majors. It is recommended that students check with one of the thre tion departments for more specific information on courses that

Education for Teaching

Programs of study in education for teaching are based upon the tion that every teacher should have a broad general education, of the content of instruction, and professional competencies.

The relative emphasis placed upon each of these aspects of education for teaching varies in accordance with the purposes program. For instance, since elementary school teachers teach all they require content preparation of greater breadth and less speci than secondary school teachers.

It is the view of the School of Education and Human Develop an acceptable minimum education for teaching requires four years time study or the equivalent in part-time study. For superior pr teachers are urged to plan for five years of full-time study or the lent in part-time study.

The student may choose any one of the following plans to superior educational preparation for teaching or for other e related fields:

1. Upon receiving the bachelor's degree in education, he or take a teaching position and, after acquiring some profes perience, return to the School for graduate study leading master's degree. This plan enables students with bachelor's to begin their teaching careers, and to use their work exper enhance graduate study which will follow.

2. The student may choose to pursue full-time graduate study to the master's degree immediately after receiving the b degree.

3. A student whose bachelor's degree is in one of the liberal ciplines may choose to complete the requirements for cer for teaching by studying in one of the teaching fields in a custom-tailored to his or her particular needs.

ULATIONS

rsity regulations concerning admission, registration, fees, and es are stated on pages 20-32; other University regulations, on pages

al Scholarship Requirements For Undergraduates

ations regarding academic standing, probation, suspension, with- ls, classification of students, required placement examinations and ng introductory courses by examination are the same as those for bian College; they appear on pages 70-71, 75, and 76-77 of this in.

EMIC WORK LOAD

n to 17 semester hours of credit constitute a normal program. A nt with a quality-point index of 3.00 or higher may, with the per- on of the dean, enroll for 18 or 19 hours. No student may enroll for than 19, except by permission of the Committee on Scholarship.
e following work load regulations apply to both graduate and under- ate students.
dents employed 15 hours or less a week may carry a normal pro- of college work.
dents employed from 16 to 25 hours a week may enroll for 12 or urs. Those with a quality-point index of 3.00 or higher may, with al permission of the dean,* enroll for 15 or 16 hours.
dents employed from 26 to 34 hours a week may enroll for 9 or 10 . Those with a quality-point index of 3.00 or higher may, with al permission of the dean,* enroll for 12 or 13 hours.
dents employed 35 hours or more a week may enroll for 6 or 7 . Those with a quality-point index of 3.00 or higher may, with al permission of the dean,* enroll for 9 or 10 hours.
dents who increase their hours of employment after registration or y time during a semester must report immediately to the dean so heir programs may be adjusted, if necessary.
duate students employed full-time may take a maximum of 6 se- r hours, unless special permission to take more is granted by the *

IRED PLACEMENT EXAMINATIONS

glish—Students whose College Board English Composition Achieve- Test scores suggest that they will benefit from more intensive ng in compositional skills may be assigned to English 9 or may be l in vocabulary, spelling, grammar, standard usage, and writing skill e placement in either Engl 9 or 10.
reign Languages—A student who has not been granted advanced

* st forms are available at the office of the dean. They should be filled out and returned office of the dean at least two weeks prior to registration.

standing and who wishes to continue in college the language
high school must take a placement examination in one of the fo
Chinese, French, German, Greek, Hebrew, Italian, Latin, Rus
Spanish. Upon completion of the examination, assignment is mad
appropriate course.

Mathematics—New students accepted for registration in Mat
required, prior to registration, to take a placement examination in
and trigonometry; those accepted for registration in Math 51
quired, prior to registration, to take a placement examination in
(See specific mathematics requirements listed under elementary o
dary education majors.)

EARNING CREDIT BY EXAMINATION

Undergraduate students may earn semester-hour credits up to a m
of 30 hours by performing satisfactorily on College-Level Exa
Program (CLEP) Tests or special departmental examinations prov
the departments of Columbian College of Arts and Sciences on
vidual basis. *Passing a waiver examination does not entitle the st
any semester hours of credit.*

Students interested in becoming certified to teach who have
bachelor's or graduate degrees in fields other than education may
some certification requirements by taking the CLEP Examinations
cial departmental examinations. See pages 22-23 for general info
on the CLEP tests, and for information on special examinations of
departments.

THE BACHELOR'S DEGREES

The School of Education and Human Development offers undergr
programs leading to the degrees of Bachelor of Arts in Educa
Human Development (elementary, middle school, secondary ed
elementary education/early childhood education; elementary ed
special education: complementary teacher program; and human
and Bachelor of Science in Human Kinetics and Leisure Studi
mentary/secondary human kinetics and leisure studies, dance ed
and dance as a performing art).

Bachelor of Arts in Education and Human Development

The programs leading to the degree of Bachelor of Arts in Educa
Human Development (elementary, middle school, and secondary e
elementary education/early childhood education, and elementary
tion/special education: complementary teacher program) are
to provide (1) general educational backgrounds, (2) functional
of concepts and skills in one or more teaching fields, (3) mastery
professional information and skills adequate for the beginning tea
(4) development of attitudes needed for success in teaching or
related human services fields.

e general educational backgrounds needed by prospective teachers
persons interested in being employed in other human services fields
btained through college courses, work experience, leadership activi-
and off-campus cultural opportunities.
part of formal course work, and on their own initiative, students of
chool of Education and Human Development are expected to take full
ntage of the many opportunities in the Washington area for develop-
eadership skills. Advisors are available to help students plan these
iences.

rsons preparing for teaching or for work in other human services
require a well-rounded education. Therefore, a student completing
126-semester-hour program in elementary education or the 132-
ster-hour double major with special education will complete approxi-
ly 78 credit hours in the liberal arts; a major in secondary education
complete approximately 96 credit hours in the liberal arts. Liberal
courses and selected professional education courses may be com-
d at George Washington University or may be accepted for advanced
ing from another accredited institution in accordance with regulations
ge 22.

perienced registered nurses and persons engaged in related health
ces or other human services areas may fulfill the requirements for a
in Education and Human Development in the field of human services
mpleting 120 credit hours.

ral Information for Freshmen and Sophomores

undergraduates admitted directly to the School of Education and
an Development are assigned academic advisors at the time of ad-
ion. Advisors are designated to provide continuity of advising for
nts throughout their years of undergraduate study. The program for
student must be approved by a faculty advisor.
ce each student's program is defined by individual needs, it is
rtant that students have a clear concept of their major interest in
ation, and that they be familiar with the certification requirements
ose localities in which they expect to teach. Information on state
sing requirements is available in the Career Services Office, located
oodhull House, 2033 G St., N.W.

nce Requirements for Freshmen and Sophomores

character and an academic background appropriate for the program
udies contemplated are required.
quirements for admission to the freshman and/or sophomore years
s follows:
An acceptable certificate of graduation from an accredited secondary
ol, showing at least fifteen units* which must include four years of
sh; at least two years of one foreign language; two years of science,
rably with laboratory instruction; two years of social studies, one
hich must be American history; and two years of college preparatory
ematics.

*It represents a year's study in a secondary school subject, including in the aggregate not
an 120 sixty-minute periods, or the equivalent, of prepared classroom work.

2. The principal's statement that the applicant is prepared to un college work.

3. College Entrance Examination Board scores submitted on the lastic Aptitude Test and the English Composition Achievement Te

It is recommended that the examinations be taken in Decem January of the senior year. Scores on tests taken in the junior ye be submitted. Arrangements for tests are the responsibility of the cant and should be made with the Educational Testing Service, 20 St., Princeton, N.J. 08540; or 1947 Center St., Berkeley, Cal. not less than one month before the date of the test. In applying test, the applicant should specify that the scores be sent to the O Admissions, George Washington University, Washington, D.C. 2005

The College Entrance Examination Board tests are preferred; he the American College Testing battery scores will be accepted. The cant should request that these scores be sent to the Office of Adm directly from the American College Testing Program, Iowa City, I is recommended that the applicant take the tests in October of the year.

The School of Education and Human Development will consi adequacy of the qualifications of an applicant who, because of circumstances, does not present all of the formal requirements above. The School may require appropriate scholastic-aptitude te

International students may be considered for admission with an lent foreign secondary certificate. A student presenting such a ce must also show competence in the English language and may be to enroll in a full-time program in English as a Foreign Language beginning studies in a degree program. Requirements will be dete on the basis of an English Proficiency Test administered on-cam candidate who submits a score of 580 or above on the Test of as a Foreign Language (TOEFL) may be excused from taking further work in English as a Foreign Language.

Students who have been out of secondary school for three ye more or do not meet the above requirements may take a special be admission tests (including among others, the Differential Aptitu Cooperative English Examination, and Ohio Psychological Test) tacting the Office of Admissions or may be considered for admis probation to the School of Education and Human Development. A admitted on probation is required to complete a trial program o mester hours of course work with a quality-point index of 2.25 higher. The selection of courses to be taken in the trial program made in conference with a faculty advisor.

Admission with Advanced Standing

Requirements for admission of students transferring from other re accredited colleges and universities, and from other divisions University, are as follows:

Students who have accumulated 15 hours or more of academi at another regionally accredited college or university with an ac program and acceptable grades may be admitted to the School of tion and Human Development. Advanced standing may be awar

erly certified courses taken at regionally accredited colleges or uni-ies for which the student received a grade of *C* or better, and may pplied toward a degree provided that such courses are comparable curricular requirements of the degree at GW.

hough a grade of *D* is not acceptable for transfer, the course may be to satisfy a curricular requirement. Credits earned with a *D* grade ot, however, be counted toward advanced standing.

School reserves the right to refuse credit for transfer in whole part or to allow credit provisionally.

s the responsibility of the student to have an official transcript sent ly from each institution formerly attended to the Office of Admis-George Washington University, Washington, D.C. 20052.

dents may transfer from another division of this University into ree program in the School of Education and Human Development. tudent must present an accumulated quality-point index of 2.00 or r at the time of transfer. A student wishing to transfer into the ol from another division of this University must submit a formal cation of transfer to the Office of Admissions and meet other require-for acceptance to the School.

rses taken at another division of this University may be applied d a degree in this School provided they are comparable to the cur-r requirements of the degree.

rses filing for admission to the B.A. program in Human Services are ed to submit a copy of their current state nurse's registration se) in addition to the official transcripts. Nurses may be awarded ad-d standing for work completed in a community or junior college pro-They may also receive advanced standing up to 30 credit hours for completed in a two-year teaching hospital program; 45 credit hours e granted for work completed in a three-year teaching hospital m.

dents applying for transfer from another accredited college or sity or from another division of this University whose previous mic records raise doubts of their ability to complete degree require-successfully may be admitted to the School of Education and Human pment on probation. To be admitted into the School's degree m, a conditionally admitted student must complete a prescribed trial m of 15 semester hours of course work with a quality-point index or higher. A student registered in another division of this University as an accumulated quality-point index of less than 2.00 and who is ionally admitted to this School must earn a 2.25 quality-point index trial program and must during this trial program bring the accumu-quality-point index to 2.00 or higher to be admitted to the School's program.

selection of courses to be taken in the trial program must be made in ence with a faculty advisor in the School of Education and Human pment. A conference concerning plans for study as a degree can-is required of each applicant at the beginning and end of the trial m. Upon successful completion of the trial program, the student who bmitted a degree-candidate application will be advanced to degree

Requirements for the Degrees

To be recommended for a degree a student must satisfy the ad residence, scholarship, and curriculum requirements. The Bachelor in Education and Human Development (elementary, middle sch secondary education, elementary education/early childhood e and elementary education/special education) requires 126 to 132 hours; the Bachelor of Arts in Education and Human Development services) requires 120 semester hours; the Bachelor of Science in Kinetics and Leisure Studies (elementary/secondary human kine leisure studies, dance education, and dance as a performing art) 124 semester hours.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily mum of 30 semester hours while in the School of Education and Development.

DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a point index of 3.5 on courses completed during the past semester time student, to be eligible, must obtain a quality-point index of 3.5 last 12 semester hours of course work. Such part-time students mu been enrolled for at least one three-hour course each semester, a dence during the period involved must be continuous.

SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see page

In order to graduate, a student must have a quality-point inde least 2.25. A quality-point index of at least 2.25 is required bef mission is granted to do student teaching in the senior year.

Probation—A student who fails to maintain a quality-point inde least 2.25 is placed on probation. The student remains on probation as the index is below 2.25, or until probation is removed by the Co on Scholarship.

Suspension—A student on probation who fails to raise the index within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, the case through the dean to the Committee on Scholarship. If the appears to be remediable and the student's scholarship seems li improve, the Committee may readmit the student on probation. A denied readmission may again, after a lapse of a calendar year, peti Committee through the dean for readmission. A student suspende will not be readmitted.

CURRICULUM REQUIREMENTS

In all bachelor's curricula at least 30 semester hours must co courses numbered above 100.

S/NO PASS OPTION

unior or senior student who has a cumulative quality-point index of
or better, may, with the approval of an advisor and the dean, take
course a semester and receive a grade of *P* (Pass) or *NP* (No Pass)
ch will be recorded on the student's transcript but will not be reflected
he student's quality-point index. No student will be allowed to take
e than four pass no pass courses. Students must sign up for such
option at registration. Students may change from pass/no pass status
raded status, or vice versa, after the end of registration only with the
mission of the dean and the course instructor. Courses required in the
dent's major field may not be taken on the pass no pass basis. A
sfer student may not choose this option until the second semester of
ollment at this University.

OMPLETE/AUTHORIZED WITHDRAWAL

nditions under which the grades of *I* (Incomplete) or *W* (Authorized
thdrawal) may be assigned are described on page 45.

emoving an Incomplete—When a grade of *I* is assigned, the instructor
uld normally set a period within which the uncompleted work (usually
final examination or a required paper) must be made up. When required
rk has been completed, it is the responsibility of the instructor to
nge the grade of *I*, as appropriate. If work is not completed, the
tructor will decide whether to change the grade of *I* to *F*, or to allow
I grade to remain. The grade of *I* cannot be removed by reregistering
the course here, or by taking its equivalent elsewhere.

ional Teacher Examination

National Teacher Examination is optional for Education students.
dents who take the Examination receive individual reports of test
es and may avail themselves of the regular transcript services of
Educational Testing Service.

ching-Field Programs

JECT-AREA SPECIALIZATION

ject-area specialization depends upon the teaching position for which
student is preparing. Those planning to teach in elementary schools need
gree of competency in several fields. Those preparing to teach in middle
ools must acquire competency in a chosen interdisciplinary subject-
ter specialization. Those preparing to teach in junior or senior high
ols must demonstrate competence in a major teaching field. A
r teaching field is optional, but recommended. The student should
n teaching-field preparation during the first two years.
eaching-field requirements for secondary education majors, developed
ooperation with appropriate departments of the University, include
factory completion of prescribed academic courses in one or more
s and satisfactory completion of the prescribed special methods
ses. Prescribed academic courses vary in number in accordance with

the scope and complexity of the teaching field and the licensing req ments of the various states.

Professional Education

The basic professional information, skills, and attitudes needed by be ning teachers are provided through a sequence of courses to be ta throughout the four years of undergraduate study. Lectures and c discussions are closely coordinated with field work. Instruction is dif entiated to meet the needs of those preparing to teach on the vari levels—elementary, middle, junior high, and senior high school.

The prescribed courses in special methods are concerned prima with methods of initiating, guiding, and evaluating learning experien dealing with the content of teaching fields. They attempt to bring to student specific suggestions drawn from the accumulated experience successful teachers. In addition, the courses review the teaching-fi content currently in use in schools.

Education Curriculum

The following is the curriculum for the first two years in preparation the Bachelor of Arts in Education and Human Development degree major fields in elementary or secondary education, elementary educati early childhood education, and elementary education/special education.

		Seme Ho
Education:	Educ 101, 102, 103, 104	
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	
Mathematics:	Math 9 and 10 (for elementary education and elementary/special education majors); two semesters chosen from Math 3, 6, 9, or 10 (for secondary education majors)	
Science:	Three semesters (two in biological science and one in physical science or vice versa) for elementary education and elementary/special education majors; two semesters for secondary education majors. Courses are to be chosen from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; or Phys 1 and 2, or 9–10	
Social Sciences:	Hist 71 or 72 and another social science course for elementary education and elementary/special education majors; Hist 71–72 or PSc 1 and 2 or 2 and 3 for secondary majors	
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2 or 2 and 3; or Soc 1 and 2	
Speech and Drama:	SpDr 1 or as approved for secondary majors; SpDr 1 or 11 for elementary education and elementary/special education majors	
HKLS:	For elementary education and elementary/special education majors	
Electives:		
	Total	

uman Kinetics and Leisure Studies Curriculum

e following is the program for the first two years in preparation for e Bachelor of Science in Human Kinetics and Leisure Studies degree th specialization in Elementary/Secondary Human Kinetics and Leisure udies. (Students should begin to acquire competency in several physical tivities in the first two years.)

		Semester Hours
Education:	Educ 102 and 103	6
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12
HKLS:	Four semester hours selected from first-group HKLS courses (59, 60, 61, 62 recommended); HKLS 102, 103, 111–12, 130, 139, 150, 151	28
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; or Phys 1 and 2, or 9–10	6
Social Sciences:	Hist 71–72, or PSc 1 and 2 or 2 and 3	6
	Six semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2 or 2 and 3; or Soc 1 and 2	6
	Total	64

irst two years in preparation for the Bachelor of Science in Human Kinetcs and Leisure Studies degree with a specialization in dance education:

English:	Engl 9 or 10 and 11	6
HKLS:	HKLS 107, 108, 150, and 157	12
	Any combination of dance courses numbered 10–58, 121 or 123	6
Education:	Educ 102, 103	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9–10; Phys 1–2, or 9–10	6
Social Sciences:	Hist 71–72; or PSc 1–2	6
	AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; PSc 1 and 2 or 2 and 3; or Soc 1 and 2	6
Speech and Drama:	SpDr 1, 11, 121 or 169	3
Electives:		13
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students interested in dance as a performing art:

English:	Engl 9 or 10 and 11	6
HKLS:	HKLS 150, 157	6
	Any combination of dance courses numbered 10–58, 121 or 123	6
Humanities:	Art 21–22, 31–32; Music 1, 3 or 4; Phil 50; SpDr 45	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2, 5; Math 3, 6, 9, 10; Phys 3, 4, 9, or 10	6
Social Sciences:	AmCiv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40, 71–72; PSc 1 and 2 or 2 and 3; Psyc 1, 5–6, 8, 22, 29; Soc 1 and 2	6
Electives:		24
	Total	60

The teaching-field programs and their requirements are as follows:

Elementary Education Program

GENERAL EDUCATION REQUIREMENTS (See page 114)

SUBJECT-AREA SPECIALIZATION

The requirements are three semester hours each, to be selected wit
proval of the advisor, of art and music survey courses (may be tak
a *P/NP* basis) and HKLS courses; 9-12 hours of science courses
include courses in both physical and biological sciences) and 6 hou
social science courses, to be selected with approval of the advisor;
1; Geog 1 and 2; Hist 71 or 72; Math 9, 10. (Some of these course
listed under requirements on page 114.)

PROFESSIONAL COURSES: ELEMENTARY EDUCATION

Thirty-six credit hours are required, consisting of Educ 105, 110, 111
128, 135. These courses are in addition to Educ 101, 102, 103, and
taken during the first two years.

Elementary Education/Special Education: Complementary Teacher Program

GENERAL EDUCATION REQUIREMENTS (See page 114)

SUBJECT-AREA SPECIALIZATION (see elementary education program above)

PROFESSIONAL COURSES

In addition to the professional courses listed for elementary education
required courses in special education are SpEd 102, 189, 170, 103, 190,
199, 160, and 168.

Elementary Education/Early Childhood Education

The general education, subject-area specialization, and professional cou
are the same as those required for elementary education. In addit
students are required to complete Educ 132, 150, 152, 153, and 154.

Middle School Education Program

The middle school education program offers four teaching-field specia
tions together with appropriate professional training. While the importa
of a thorough understanding of the nature of the middle school learner
the middle school is emphasized, equal stress is placed on early and c
tinued direct experiences in the middle school. This experience culmin
in a senior-year block instructional program conducted largely in
field.

GENERAL EDUCATION REQUIREMENTS (See page 114)

BJECT-AREA SPECIALIZATIONS

mmunications: 30 credit hours
fe Science: 30 credit hours
rth/Space Science: 30 credit hours
cial Science: 30 credit hours

OFESSIONAL COURSES

irty-six credit hours are required, consisting of Educ 105, 110, 112, 134, special methods course selected from Educ 136, 137, 138, and 144, and ectives planned with an advisor.

condary Education Programs

the secondary education program a number of teaching-field specializa-ons are offered. However, it is strongly recommended that, wherever ossible, a candidate undertake the equivalent of a minor in an inter-isciplinary subject area. Early counseling by the program advisor is urged ensure a balanced and realistic program of study. The requirements the secondary education program are as follows:

ENERAL EDUCATION REQUIREMENTS (See page 114)

UBJECT-AREA SPECIALIZATIONS

rt—42 credit hours, including Art 1 and 31-32 or 71-72, and two second-r third-group art history courses if open to undergraduates; 27 credit ours to be selected from the following: Art 21-22, 23-24, 41-42, 51-52, 57-8, 65-66, 81-82, 123-24, 125-26, 127-28, 131-32, 137, 143-44, 151-52, 153-54, 57-58, 163-64, 179-80, 181, 182, 189-90.

iology—46 credit hours, including BiSc 11-12 and 101 or 104 or 145, 108 r 127, 128, 140, 163, 164, and two advanced botany courses as approved by he advisor; Chem 11-12; Phys 1 and 2.

hemistry—40-44 credit hours, including Chem 11-12 or 15-16, 22, 110 or 11, 134, 151-52, 153-54, 191; Math 6, 30, 31; Phys 1 and 2.

arth Science—49-52 credit hours, including BiSc 3-4; Chem 11-12; Geol 21-22, 101, 111, 125, 151; Math 3 and 6; Phys 1; 6-9 additional credit hours, s approved by the advisor, to be selected from the following: Anth 186; Geol 122, 128, 141, 163, 189.

nglish—39 credit hours, including Engl 9 or 10, 11 or 12, 52, 71-72, 101, 15, 127-28; SpDr 11; and nine credit hours to be selected from the follow-ng as approved by the advisor: Engl 117-18, 133-34, 135-36, 153-54, 155-56, 161-62, 163-64, 165-66, 167-68, 171-72, 173-74, 175-76, 177-78.

rench—42 credit hours, including Fren 9, 10, 51-52 or 91-92, 103, 108, 09, 110, and two full-year second-group French literature courses; 6 se-mester hours from the following: Art 109, 110; Engl 115; a foreign language other than French as approved; Hist 141-42; Psyc 115.

General Science—43-45 credit hours, including BiSc 3-4; Chem 11-12 16, and 22; Phys 1 and 2 or 9-10; 10 additional credit hours in scie approved by the advisor; 9 credit hours of math to be selected fr following: Math 3, 6, 30, 31, 32, 33.

Geography—24 credit hours, including Geog 1 plus 21 credit hours selected from the following: Geog 104, 105, 106, 125, 127, 132, 13 140, 141, 142, 143, 145, 146, 154, 161, 198.

German—33 credit hours, including Ger 9-10, 51-52, 179-80, and 15 tional credit hours in German as approved by the advisor.

History—42 credit hours, including Hist 39-40 and 71-72; 6 credit of a history research seminar; 6 credit hours in each of three following groups as approved by the advisor: American, Europea Eastern, modern, Middle and East African, or Latin American hist additional credit hours as approved by the advisor, in any one preceding groups.

Mathematics—39 credit hours, including Math 30, 31, 32, 33, 121, 124, 135; three additional second- or third-group mathematics c approved by the advisor; Stat 97, 157-58.

Music—42 credit hours, including Mus 5-6, 103-4, 131-32; 6 credit ho applied music in voice or a major instrument; 6 credit hours of a music in minor instruments; 3 credit hours of choral or orchestr semble; 9 credit hours in music literature or music theory as appro the advisor.

Physics—36 credit hours, including Math 30, 31, 32, 33; Phys 14, 161, 163, 164, 165, 167.

Russian—36 credit hours, including Slav 9-10, 71, 91-92, 141-42 or 197, 198; 9 additional credit hours from the following, as approved advisor: Slav 101, 103, 104, 109-10, 128, 143-44, 146, 153, 156, 15 161-62, 165, 166, 172, 191, 193-94.

Social Sciences—42 credit hours, including Econ 1-2; Hist 39-40, PSc 1 or 3 and 2; 6 credit hours to be selected from the following 1-2; Geog 1, 2; Soc 1, 2; plus 12 credit hours of second-group co as approved by the advisor, from anthropology, economics, geograph regional science, history, political science, and sociology.

Spanish—42 credit hours, including Span 9-10, 51-52 or 91-92, three full-year courses selected from second-group Spanish or Sp American literature courses; 6 credit hours to be selected from the fo ing: Engl 115; a foreign language other than Spanish as approved 161, 163-64, 165, 166; Psyc 115.

Speech and Drama—36 credit hours, including SpDr 1, 11, 45, 49 103, 110, 112, 121; plus 12 credit hours to be selected from speech com cation or drama courses, as approved by the advisor.

PROFESSIONAL COURSES*

The requirements are 21 to 27 credit hours, consisting of Edu-

* A course in the teaching of reading is recommended since it is required for employ many jurisdictions.

(for undergraduate credit), 112, 131, 134 (6-9 credit hours), and 3 credit
rs selected from Educ 136, 137, 138, 139, 140, 144, 146. These courses
in addition to the following courses, usually completed during the first
years: Educ 101, 102, 103, 104.

chelor of Science in Human Kinetics and Leisure Studies

e program, which is designed to prepare students for teaching in
mentary and secondary schools, offers opportunities for specialization
dance education and elementary/secondary school physical educa-
n. A program is also offered in dance as a performing art for persons
interested in certification for teaching.

Prerequisite—For the first two years of the Bachelor of Science in
man Kinetics and Leisure Studies curriculums, see page 115.

Specialization in Dance Education, junior and senior years—
e following courses are required: Educ 104, 105, 112; HKLS 109-10, 117,
, 133, 135-36, 141-42, 144, 150, 151, 175, 200; plus 6 credit hours of
ctives.

Specialization in Dance as a Performing Art, junior and senior years—
e requirements consist of 10 credit hours selected from HKLS 10-58, 121,
123; and HKLS 108, 109-10, 120, 135-36, 137 or 200, 141-42, 144, 173,
; plus 19-21 credit hours of electives.

Specialization in Elementary/Secondary Human Kinetics and Leisure
udies, junior and senior years—Sixty credit hours are required: SpDr
or 11; Educ 104, 105, 112; HKLS 113, 114, 129, 138, 158, 164, 171, 133;
s 12 hours of an HKLS area of concentration and nine hours of electives.

chelor of Arts in Education and Human Development—
ogram in Human Services

The program in Human Services is designed for personnel in the follow-
representative types of human service fields: nursing, gerontology,
ntal health, criminal justice, etc.

The program in Human Services is planned to: (1) enable individuals
develop their cognitive and affective abilities; (2) meet a range of human
vices needs; (3) develop human interaction and leadership skills; (4)
ilitate entry into or advancement in human services occupations; (5) gain
awareness and appreciation for interacting values in a pluralistic
ciety; and (6) prepare for graduate study in a professional field.

The program features a variety of fieldwork and classroom lectures,
minars, and consultation. Opportunities are provided for acquaintance
th diverse human service settings and professionals in the field, and
academic concentration in departments throughout George Washington
iversity.

Programs for students will be individually planned after an evaluation
made of previous professional and educational experiences and long-
ge goals.

Advanced standing may be awarded for liberal arts and specialization
rses completed at accredited colleges and universities. Advanced stand-
will be granted for registered nurses who have completed two- or three-
r programs at accredited teaching hospitals—30 credit hours for two-
r programs and 45 credit hours for three-year programs. Credit will be

recognized for courses completed in the sciences, but not in the liberal arts.

Students will be required to complete the following liberal arts requirements for the degree, either in previous work at another institution or at George Washington University.

English:	Engl 10 and 11; 51, 71, or 191
Mathematics:	Math 3, 6, 9, or 10
Psychology:	Psyc 1
Science:	BiSc 3, 4; Chem 3, 4; Geol 1, 2; Phys 1, 2; Phys 9, 10
Social Sciences:	Hist 71–72; or PSc 1 and 2 or 2 and 3
Speech and Drama:	SpDr 1

Core courses include Educ 101, 102, 103, 104, 112, 162, 163, 176, 263 or 279; and SLP 152.

Concentrations of 12 to 24 hours may be selected in adult education, dance therapy, early childhood education, human resource development, movement education, special/early childhood education, vocational special education, tourism and travel, and therapeutic recreation.

Teaching Emphases for Majors in Elementary Education and Secondary Education

The School of Education and Human Development offers courses and programs that are educationally sound and enriching and that enhance opportunities for graduates to obtain teaching positions throughout the United States. Special teaching emphases have been developed, consisting of courses which students are encouraged to select to satisfy elective hours in their programs in elementary or secondary education.

Teaching emphases are offered in the following areas:

Guidance and Counseling
International Education
Movement Education
Reading
Speech Pathology and Audiology
Tourism

Most teaching emphases are designed to focus on areas of recognized need for elementary and secondary pupils throughout the nation, particularly those in large urban centers. Graduates of these programs, with added skills and understandings in these critical areas, should be attractive candidates for teaching positions.

A field that has experienced significant growth, both nationally and internationally, is tourism and travel. The academic advisor in tourism will try to assist students who select this sequence to find part-time work in travel agencies and bureaus to enhance classroom experience.

Many of the courses offered in the teaching emphases have been developed directly from master's degree programs of the School of Education and Human Development and assigned undergraduate numbers.

Students interested in more detailed information about these sequences are encouraged to contact the Dean's Office, School of Education and Human Development, or their academic advisors.

The following represents a breakdown of the specific courses in each of the teaching emphases:

ce and Counseling: Educ 161, 162, and 163.

tional Education: Educ 171, 172, and 173.

ent Education: HKLS 101, 102, 113, 129, and 130.

g: Educ 100, 110, and 111.

Pathology and Audiology: SpDr 1, 101, 103, 104, 108, 118, 119, and 115.

n and Travel: HKLS 104, 113, and 184.

UATE STUDY

chool of Education and Human Development offers graduate pro- leading to the degrees of Master of Arts in Teaching, Master of n Education and Human Development, Education Specialist, and r of Education.

ES

raduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Mini- Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; ilure, Unauthorized Withdrawal; *CR*, Credit. Grades *A*, *B*, *C*, and *F* ounted in computing the quality-point index (see page 45).

enever a grade has not been assigned, the symbol *I* (Incomplete) or ymbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* ates that a satisfactory explanation has been given to the instructor e student's failure to complete the required work of the course. An ctor recording a grade of *I* will normally stipulate a date by which must be completed. The instructor has the responsibility for changing ade of *I* to an appropriate grade upon completion of work, or, if work completed by the stipulated date, determining whether the grade of ld be changed to *F* or allowed to remain in the record.

DEGREE OF MASTER OF ARTS IN TEACHING

School of Education and Human Development offers an intensive, isciplinary fifth year in museum education. This program is designed pare selected liberal arts graduates, postgraduates, and professionals ducation work in a museum or for liaison work between museums chool systems. Students receive the degree of Master of Arts in ing upon completion of the program.

details write the chairman of the Department of Education, M.A.T. m, School of Education and Human Development, George Washing- niversity, Washington, D.C. 20052.

SION

admitted to the program in museum education an applicant must (1) a bachelor's degree from an accredited institution; (2) submit three

written references attesting to quality of academic record and w
perience; and (3) be interviewed by the University Selection Co
or make alternative arrangements specified by the Committee and s
by the dean of the School of Education and Human Developme
sidered essential are skills in communication, a desire to study a
from the artifacts of nature and civilization, and an ability for and
in working with people. Evidence of strong undergraduate, grad
professional experience in such fields as American history, geology
the social sciences will be considered favorably.

PLAN OF STUDY FOR THE MUSEUM EDUCATION PROGRAM

The program begins with a six-week summer session. Emphasis i
study of museums and communication skills. During the fall s
students study the school as an institution—its organization, pupil
tion, staff and services—and as a laboratory, where they will work
rooms with students and teachers. The program will also focus
museum audiences. Students will earn at least 12 semester hours
in an academic concentration. During the spring semester stude
have an internship in area science, art or history museums.

THE DEGREE OF MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

Programs of study leading to the degree of Master of Arts in E
and Human Development are designed to enable prospective teac
experienced teachers to increase their professional and academi
edge and skills and to prepare for special types of educationa
They also provide opportunities for college graduates in other di
to acquire needed professional education, as well as study in the
which are directly related to their professional objectives.

Master's programs are available in the fields listed on the f
pages.

Adaptive Physical Education

The primary goal of the adaptive physical education degree prog
make a contribution toward alleviating the shortage of trained p
in physical education for handicapped persons. The program al
to retrain physical educators for new roles in public school sys
developmental and rehabilitation settings. The program focuses
adaptive physical educator as part of the comprehensive treatme
therefore a multidisciplinary approach is emphasized.

Adult Education

The program of study in the field of adult education prepares stu
positions in educational institutions, voluntary organizations,
institutions in the private or public sectors which sponsor adult
programs. The students enrolled in this program obtain the skill
derstandings required to perform functions associated with
of learning specialist, administrator, counselor, and consultan
field of adult education.

ge Student Development

master's degree program in college student development provides the emic, professional, and philosophical preparation for entry-level ions in the field of student affairs. The program provides education dministration, counseling, group facilitation, leadership training, and izational development. Many graduates are employed in colleges niversities in the areas of career development, international student ing, residence hall programming, financial aid, student affairs research, nt activities, admissions, and counseling.

culum

master's degree program in curriculum has been developed to assist ators in meeting state licensing requirements for school administration supervision. Courses cover a broad range of theory and practice and ppropriate for non-school-based agencies and for educators con- d with program or learning media development.

master's degree program in dance is designed to prepare dance alists for roles in the areas of choreography, therapeutic dance, dance tion, performance, or for specific areas of specialization, i.e. criticism, y, research. The student plans with the advisor a course of study that ders individual background, professional interests, and career goals.

Childhood Education

master's degree program in early childhood education prepares ers, directors, and supervisors in nursery schools, day care centers, indergartens, as well as researchers and program specialists in the

ntary Education

aster's degree program in elementary education is planned to help ers continue their professional growth and advance in competence ir work in regular elementary school classrooms. The program may ed to develop an academic specialization for work with elementary children, or to explore fields of specialization for present or future sional goals.

tary/Secondary Administration

raduate program in educational administration is designed to pre- students for leadership roles in public and private educational zations. The master's degree program in elementary and secondary stration is considered to provide the minimum entry-level prepara- r the positions of principal, assistant principal, and head of depart-

l Physical Education

rogram permits students to take courses in allied areas and cognate o enhance their ability to compete for more varied employment

opportunities in general physical education. The electives ar
by the student in consultation with the advisor and are based
ground and professional goals.

Generic Counseling

The generic counseling program prepares individuals to do v
educational, or personal counseling in community or gov
agencies.

Gifted and Talented

This program is planned to help students to prepare themselves
prehensive and research-based manner to teach gifted and tale
viduals; to design programs and prepare appropriate instruction
gies and materials for the gifted and talented; and to supe
administer programs for the gifted and talented. Graduates wil
pared to work with gifted and talented individuals at a self-selec
ranging from early childhood through adulthood.

Guidance and Counseling

The guidance and counseling program prepares individuals to be
to work as counselors in elementary or secondary schools.

Higher Education

The higher education program affords the student a concentr
administration, teaching, or curriculum. Courses prepare stud
administrative positions in areas generally encompassing college
versity organizations: academic affairs, public relations, finance,
velopment.

Human Resource Development

The program of study in the field of human resource develop
designed for persons either entering or advancing in positions as
with training, education, and development activities in business, i
government, and other large organizations in the public or private
The program prepares students with the skills and understanding
for responsibilities as learning specialists, administrators, and co
in this field.

Individualized Master of Arts

This program permits development of individualized programs w
across existing fields, both within the School of Education and
Development and between Education and other schools and depa
of the University and Consortium. The program is designed to meet
professional objectives of applicants with unique needs. It will be
to relate independent study, special workshops, international exp
and a thesis to identified objectives. There must be a balance
foundational and specialty preparation and between theoreti
practical experiences.

ptual-Motor Development

purpose of this program is to assist the student in developing the y to observe performance, analyze tasks, assess developmental level, ribe appropriate activities, and apply appropriate learning strategies. uates are now working as motor development specialists and team bers in special education settings, resource personnel for mainstream- urriculum specialists in movement education and perceptual-motor opment, and activity coordinators in public and private day care rs.

ng

hers who have completed this program have been employed in various ol systems, as special reading teachers, reading clinicians, reading ultants, or reading supervisors. Persons who complete the program ourses selected from it) will be more attractive candidates for regular room teaching positions, in addition to being more effective teachers.

bilitation Counseling

program prepares individuals to provide vocational counseling and hosocial services to people confronted by problems of physical, emo- l, intellectual, or social disabilities. Employment opportunities for ed counselors exist in state vocational rehabilitation agencies and nunity agencies such as sheltered workshops, rehabilitation centers, mental health settings. The rehabilitation counselor functions mainly counselor but also as a coordinator of services provided.

dary Education

program is designed primarily for junior and senior high school ers who wish to further develop their skills and competencies in ing. The program is also useful to those interested in learning about dary schooling in the United States.

al Education

ly Childhood Special Education

early childhood special education program consists of 39 semester of graduate credit designed to bring students insight and knowledge areas of the development of young exceptional children; handicap- conditions of early childhood; identification and assessment pro- es in early childhood special education; clinical teaching of develop- lly disabled young children; and alternative models of service developmentally disabled young child. This two-pronged program es teachers of developmentally disabled young children (a direct e role), and early childhood special education strategists (a consul- le). Admission requirements differ for each role. Eligibility for this m is best determined by a personal interview with the program

on Special Education

a non-teaching special education program preparing professionals ne expertise to provide leadership and liaison services in the inte-

gration of special education, health, and social services for t
capped child and his or her family.

Vocational/Special Education Program

This program is designed to provide trained personnel to assist t
capped to become self-sufficient in an increasingly complex soc
emphasis of the program has been placed on career training in
assist the handicapped person to obtain a constructive plac
working community. The student receives intensive training in as
individual educational planning, pre-vocational education, support
tional education, academic programs, and community place
graduate of this program will be prepared to be either a *classroo*
teacher in a secondary-level school, serving as a work-study coo
or special education classroom teacher, or a *school-based* resource

Supervision and Human Relations

The program in supervision and human relations prepares per
administrative and supervisory positions in public and private sch
school districts. The program is designed to lead toward licen
administrative and supervisory positions in nearby states. Basic
relate to general supervisory principles and responsibilities, and
be of interest to educators in non-school agencies.

Therapeutic Recreation

The program prepares students for positions in therapeutic recre
hospitals, institutions, day care centers, geriatric facilities, co
recreation departments, and other facilities which provide ser
special populations. At least seven roles have been identified
field of therapeutic recreation: these include therapist, counselor
tor, supervisor, administrator, researcher, and consultant.

Tourism Development and Travel Administration

The program has an emphasis that is international in scope; it
cerned with public travel and tourism offices, convention and
bureaus, research and planning firms, financial institutions, tou
salers, travel agencies, educational institutions, and corporat
volved in travel and tourism. The program is intended for those co
with developing competencies needed for advancement in tour
travel organizations, and with preparing entry-level professio
placement. Graduates are now employed by travel-related bus
colleges and universities, national tourism agencies, resorts, and
travel/tourism organizations.

For teachers interested in developing or strengthening their a
competence, the Master's programs in elementary and secondary
normally permit 15 to 18 semester hours of work in departments o
education. These programs are designed to meet the need of tea
service who need additional work in content to qualify for advance

or to improve their classroom skills and may also be helpful to
usly trained teachers planning to re-enter the profession. The major
sis is upon strengthening both the academic and professional com-
ies of the teacher.
tional information concerning these programs may be obtained by
or telephoning the office of the dean.

NCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION
UMAN DEVELOPMENT

helor's degree from an accredited institution and an undergraduate
-point index of 2.50 or above (C+ average) are required. Students
quality-point index is in the range of 2.3 to 2.49 will be considered
ovisional admission. The quality-point index is computed on the
of the last two years of the bachelor's degree program and on all
work completed beyond the baccalaureate.
years of successful teaching are required before admission to can-
in the field of school administration. Experience may be required for
sion to programs in adult education and human resource develop-

lidates whose undergraduate preparation does not include equiva-
f the basic requirements for the degree of Bachelor of Arts in Edu-
must make up deficiencies and may be required to take designated

nterview in the office of the dean is required for applicants who
the Washington, D. C., metropolitan area; a letter of reference is re-
of all other applicants.

NCED STANDING

ced standing is granted for approved courses taken at other ac-
d institutions, but a minimum of 24 semester hours must be com-
at this University as a master's candidate.
aximum of 12 semester hours of advanced courses completed in
iversity in excess of the requirements for the bachelor's degree may
lited toward the master's degree if the work fits in with the student's
specialization.
anced standing is not granted for work completed five or more years
application for admission or readmission to master's candidacy.

F STUDY

n of study leading to the degree of Master of Arts in Education
man Development requires a minimum of 33 hours of graduate
The plan may, at the student's option, include a thesis carrying six
f graduate credit. Whether or not a student selects the thesis
a minimum of 18 hours must be from courses planned primarily
duate students (third-group courses). The 18 hours must include a
n research methods and procedures. A minimum of 12 hours, not
g the thesis or the research course, must be from courses offered
School of Education and Human Development.

Programs may include additional teaching-field preparation cases, however, undergraduate and graduate courses combined at least equivalent to the undergraduate requirements for the Bachelor of Arts in Education and Human Development.

Programs are planned initially in conference with an admissio in the School of Education and Human Development and subsequ a designated advisor in the candidate's area of specialization. T grams are based on the candidate's interests and background a certification requirements of the state and locality in which the plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete sati 24 semester hours in residence.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Student ceive the grade of *C* in more than six semester hours are s suspension. Students who receive a grade of *F* must confer with before enrollment for further work.

THE THESIS

The choice of the thesis subject must be approved in writin student's advisor and filed in the office of the dean. A statemen School of Education and Human Development standards for the printed copies of detailed regulations regarding the form and rep of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidat the period of registration, to the advice and direction of the of the faculty under whom the thesis is to be written. In case is unfinished, additional time may be granted. The student must be enrolled continuously in the program. If the preparation of extends beyond the additional time granted, the student must re the entire six hours of thesis again and pay tuition as for a repeate

MASTER'S COMPREHENSIVE EXAMINATION

Candidates in M.A. programs requiring 33 semester hours may, approval of their academic advisors, elect to take an additiona semester-hour course in lieu of a comprehensive examination. Ca in programs whose basic requirements exceed 36 semester ho waive the comprehensive examination with approval of the advisor. Candidates who plan to take the examination must be in the semester it is to be taken and must file a written applicati office of the School of Education and Human Development no l

ys prior to the date of the examination. Comprehensive examinations equired of students in Early Childhood Education, College Student lopment, Gifted and Talented, Reading, and all programs in Human ics and Leisure Studies.

DEGREE OF EDUCATION SPECIALIST

program of advanced study leading to the degree of Education Spe- is for students with master's degrees in education who seek further ssional preparation for specific objectives.
ucation Specialist programs are available in the fields of administra- adult education, counseling, curriculum, higher education, and human rce development.

nce Requirements

degree of Master of Arts in Education, or equivalent; two years of nent experience in education; a graduate scholastic average of ast 3.3 or a 50th percentile score on the Graduate Record Examina- or Miller Analogies Test are required. A score on one of the specified must be submitted as part of the admission procedures.
ch applicant must be interviewed and recommended by a faculty or in the major field who will submit a tentative program plan prior mission.

larship

larship requirements for the degree of Education Specialist are the as those for the degree of Master of Arts in Education and Human lopment (see page 128).

rams of Study and Degree Requirements

idual programs are developed, through the faculty-advisor plan, to fit candidate's skills, interests, and career goals. A minimum of 30 ster hours beyond the requirements of the degree of Master of Arts ducation is required. At least 21 hours of this work must be taken mpus at this University; with the approval of the advisor, the remain- emester hours of the program may be taken in off-campus offerings e GWU College of General Studies or at another approved university. aximum of five calendar years is allowed for completion of the am.
least 12 of the required 30 hours must be in appropriate graduate es in education selected from the following areas: (1) foundations and te study, (2) background and general principles of the field of study, area of specialization.

Comprehensive Examination

ssful completion of a six-hour written examination and/or an oral ination, at the option of the major field advisor, is required.

THE DEGREE OF DOCTOR OF EDUCATION

The School of Education and Human Development offers pro advanced study leading to the degree of Doctor of Education. T grams, which are under the supervision of the Advanced Graduate provide major fields of study in teacher education, special ed counseling, administration and curriculum, adult education, human ment, human resource development, and higher education. Support are available in administration, administration of higher educatio education, college student development, counseling, curriculum, tary education, higher education, human growth and development resource development, international education, reading, secondary tion, special education, supervision, teacher education, and tou velopment and travel administration. With the approval of the A Graduate Faculty and the departments concerned, one support may be taken in other departments of the University. All programs study of interrelated areas of education and a doctoral dissertatio major field of study.

Admission

The applicant must have adequate preparation for advanced study. ing graduate work in fields prerequisite to his or her objective, eq to that required for the degree of Master of Arts in Education University, at least three years of successful pertinent educatio perience, acceptable personal qualities, and a capacity for creative ship and effective leadership.

The applicant first arranges for an interview with the assista to explore the applicant's needs in relation to the resources of the and to guide the student in applying for doctoral study. The procedures and standards will be explained at this time. Candidate ing the initial standards are admitted to precandidacy for the d

PRECANDIDACY

In the precandidacy period a minimum of nine semester hours o work in the program, including requirements specified by the A Graduate Faculty, must be completed. This work must be co within three semesters of admission to precandidacy, for p students, or within the first 18 semester hours of course work time students. Application for full candidacy will then be decide basis of the quality of scholarship in the precandidacy period, the mendations of instructors, a detailed plan for the balance of the and a qualifying examination.

Plan of Study

In general, from two to three years of full-time study beyond the of Master of Arts in Education, or the equivalent in part-time st required. Programs are individually planned. It is estimated that average student, the work required for the total program will

ster hours, including a minimum of 12 semester hours of dissertation
rch.

ch program is divided into two parts. The first consists of preparation
omprehensive examinations in a major field of study and two sup-
ng fields, and completion of a required research tool field. The second
mposed of research investigation, the writing of a dissertation, and
inal oral examination.

udents who have completed the comprehensive examinations must
ter for a minimum of six semester hours of *Dissertation Research*
c 491) per semester until 12 hours have been completed, and a mini-
of three semester hours a semester thereafter, up to a total of 24
ester hours, until the satisfactory completion of the final examination.

PREHENSIVE EXAMINATIONS

n admission to doctoral candidacy the student is assigned to a com-
ee, each member of which is responsible for guiding the preparation
ne of the required comprehensive examinations in supporting fields
e major field comprehensive examination. The candidate must arrange
vidual conferences with the committee members to determine the
ent of each field and to receive guidance in preparation for the
ination.

e supporting field examinations, which are taken first, are three-hour
ten examinations. In addition to the research tool field a student who
s a historical research investigation for the dissertation may be re-
d to complete an appropriate research seminar offered by the Depart-
of History. The tool requirement must be completed prior to the
r field examination. The major field examination is a written 12-hour
ination, six hours on each of two successive days.

e candidate begins the second part of the program after the satis-
ry completion of all supporting field examinations, the required
rch tool field and the major field examination.

DISSERTATION

ssertation is required as evidence of ability to perform scholarly re-
h and to interpret and present its results.

ring the first part of the program, the dean appoints a dissertation
nittee, consisting of a chairperson (usually a major field advisor) and
additional faculty members. The candidate is required to submit a
sal for the dissertation to this committee, which determines its ac-
bility. The dissertation is completed under the guidance of the chair-
n, with the advice of the other members of the dissertation com-
e.

later than the date specified in the calendar, the candidate must
it to the dean five complete copies of the dissertation and two copies
abstract for inclusion in the announcement of the examination and
eproduction by University Microfilms, Inc. Printed copies of detailed
ations regarding the form and reproduction of the dissertation, prep-
n of the abstract, and services offered by University Microfilms, Inc.,

are available in the office of the dean. The successful candida
doctorate is required, before receiving the degree, to pay a fe
the expense of printing the Announcement of the Final Examinat
cover the basic service rendered by University Microfilms, In
sign a microfilm agreement.

THE FINAL EXAMINATION

When the dissertation has approval of the director, the candidate
mended to the dean for the final oral examination, which must
at least three weeks before the degree is to be conferred. The ex
is open to the public and is conducted by a committee of th
appointed by the dean, supplemented by at least two leaders in
date's field of study from outside the University. Candidates who
fully pass the oral examination are recommended for the degre
faculty of the School of Education and Human Development.

Residence and Continuous Study

All the preparation for the degree, including examinations, cours
nars, and other work done under the direction of an advisor, must
in residence. The student must be continuously enrolled in the S
Education and Human Development, unless the dean or the A
Graduate Faculty grants a leave of absence. Failure to regis
semester of the academic year may result in lapse of candidacy.
quent readmission is subject to whatever new conditions and re
have been established by the Advanced Graduate Faculty.

The supporting and major field examinations must be complete
five years of the date of admission, and the entire program
completed within eight years, regardless of full-time or part-tim
All candidates must satisfy one of three options for full-time st
formation concerning these plans will be provided by the assist
upon request by the candidate.

SPECIAL PROGRAMS AND SERVICES

Education of Teachers of Exceptional Children

The School of Education and Human Development offers a progra
education of teachers of exceptional children. Laboratory experi
arranged in schools for handicapped children in the metropolit
Students are accepted at the junior- or senior-year undergraduate,
education specialist, and doctoral levels. By special permission,
school administrators, and adequately prepared students fro
schools and colleges of the University may elect these courses.
concerning the program and the availability of scholarships and
ships should be directed to Dr. Rita Ives, Department of Spec
cation, George Washington University, Washington, D.C. 20052.

Graduate Program in Rehabilitation Counseling

This federally funded master's degree program trains rehabilitati

s to assist those who are disabled or disadvantaged to assume a place ciety. The two-year program combines fieldwork and coursework in aring students for employment in an expanding field that yields high anitarian rewards. Both the profession and the program are inter-plinary, drawing upon such related areas as guidance, medicine, psy-ogy, social work, sociology, and special education.

quiries concerning the program, the availability of traineeships for time students and applications should be directed to Dr. Daniel Sinick, bilitation Counselor Education, George Washington University, Wash-n, D.C. 20052.

luate Specialization in Therapeutic Recreation Adaptive Physical Education

master's degree program in the field of physical education, with a ialization in therapeutic recreation or adaptive physical education, is led by the Bureau of Education for the Handicapped, U.S. Office of cation. Both programs require an intensive internship (minimum of 510 k hours) in University-affiliated training centers in Washington area pitals, schools, clinics, and public agencies. Inquiries concerning this gram and the availability of graduate research assistantships and in-ships should be directed to the Chairman, Department of Human etics and Leisure Studies, George Washington University, Washington, 20052.

rapeutic Recreation Technician Certificate Program

Department of Human Kinetics and Leisure Studies offers a certificate gram in therapeutic recreation. This prototype technician program trains professional personnel to work in a variety of settings, such as com-ity recreation, state institutions, correctional facilities, and nursing es. The curriculum emphasizes the therapeutic recreation process activity leadership skills. Students who complete the program will lify for professional registration with the National Therapeutic Recrea-Society. Students in the Human Services Program may participate his program as an area of concentration in therapeutic recreation. iries should be addressed to Ms. Andrea Morris, Department of Human etics and Leisure Studies, George Washington University, Washington, 20052.

tification Curricula

School of Education and Human Development provides individually ned programs for liberal arts graduates with appropriate degrees from redited institutions who wish to prepare for teaching. Those seeking ification, but not wishing to work for a degree, may enroll in a certi-ion program if they meet the admission, scholarship, and personality irements of degree candidates. The School also provides a wide range ourses of interest to teachers who wish to renew licenses.

ding Center

pages 53-54)

Off-Campus Degree Programs

The School of Education and Human Development has academic
tion over the off-campus programs leading to the degree of Maste
in Education and Human Development in the fields of adult ed
elementary education, generic counseling, higher education, hu
source development, reading, secondary education, special educati
childhood, vocational special education, and supervision and
relations. The degree of Education Specialist is offered in admini
and higher education.

These degree programs are administered by the College of
Studies. For details concerning the off-campus programs see the
of General Studies Bulletin.

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

Dean N.M. Loeser
Associate Dean L. Gintzig
Assistant Deans D.F. Bergwall, J. Lobuts, Jr.

FACULTY*

Professors E.B. Adams, F. Amling, G. Black, D.S. Brown, B. Bur
S.R. Chitwood, K.J. Darr, M.C. Devolites, S.F. Divita, R.F. Dye
Eastin, A. El-Ansary, R.W. Eldridge, R.F. Ericson, M.G. Gallag
Gintzig, P.D. Grub, W.C. Handorf, J. Harvey, W.J. Keegan, F.C.
G.P. Lauter, E.J.B. Lewis, G.L. Lippitt, N.M. Loeser, A.J. Mastro
McGrath, Jr., H.R. Page, C.M. Paik, P.N. Reeves, D.D. Roman, J.B.
(Visiting), E. Timbers, P.B. Vaill, J. Zwick
Adjunct Professors W.J. Auton, P.D. Nelson
Associate Professors P.S. Birnbaum, G. Bodnar, B.L. Catron, J.P.
H.J. Davis, E.H. Forman, S.S. Fuller, F. Ghadar, S. Greene, E.W.
W.E. Halal, W.W. Hardgrave, M.M. Harmon, R.L. Holland, E.L. Hu
(Visiting), J. Lobuts, Jr., J.F. McCarthy, Jr., A.E. Merget, C.R. Mill
Pearce, J.M. Sachlis, S.N. Sherman, R.G. Shouldice, W.E. Smith,
Southby, C.J. Testa, S.J. Tolchin, S. Umpleby, C.W. Washington
Winslow, E. Yecheskel *(Visiting)*
Adjunct Associate Professor S.T. Fisher
Assistant Professors W.C. Adams, T.M. Barnhill, D.F. Bergwall,
Breneman, N.G. Cohen, G.E. Crum, J.D. Frame, D. Gale, D.R. Kan
Lind, P.B. Malone III, C.P. McKelvey, P. Welling
Adjunct Assistant Professors P.T. Bruder, J.R. Carey, H.C. Coffe
Dooling, D.F. Eversmann, D.L. Hagengruber, M. Meyer, J.E. Monts
C.B. Smiley, Jr.

* The President of the University, the Vice President for Academic Affairs, the Regist
University, the Director of Admissions of the University, and the University Librari
officio members of the Faculty of the School of Government and Business Administration.

tructor M.L. Slagle *(Visiting)*
unct Instructors C.A. Allen, M.J. Benson, J.E. Clair, G.E. Farrelly, . Henderson III, R.P. Hill, J.P. Kelly, P.L. Knight, W.W. Knox, W.F. eadbeater, A.C. Riley, J.A. Talbot

nmittees*

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. Bodnar, E.H. Forman, D.E. Gale, A.E. Merget, S.N. Sherman, R.G. uldice

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MMITTEE ON UNDERGRADUATE STUDIES

. Bergwall, A.I. El Ansary, C.M. Paik, J.Y. Ruth, C.J. Testa

TRODUCTION

is School was organized as the School of Government in 1928. During e next two decades, programs in business administration and public adnistration were added, and the emphasis gradually shifted from underduate to graduate study. The name was changed in 1960 to the School Government, Business, and International Affairs to reflect more acately the offerings of the School. In 1966 two schools were established—e School of Government and Business Administration and the School of blic and International Affairs.

rposes

e School of Government and Business Administration is dedicated to ademic excellence through the study, teaching, and research of managent and policy in the public and private sectors, both within the United tes and internationally.

Over a span of half a century, the School of Government and Business ministration has developed a learning community in which mature in-

* The Dean of the School is an ex *officio* member of all committees.

dividuals can prepare themselves to assume membership and lea
roles in society. The School practices a multi-disciplinary approach
flexibility in educational programming in the belief that such is esse
dealing with the complexities of today's organizational society. The
offers preparation of both the generalist and the specialist for profe
careers, and seeks to improve the quality and character of the ind
as citizen, professional, and scholar as well.

More specifically, the purposes of the School are:

1. To prepare its graduates for positions in the management of o
organizations.

2. To provide a broad and fundamental education as preparati
positions carrying management and leadership responsibilities.

3. To provide specialized educational opportunities as preparati
career positions in professional disciplines or functional areas.

4. To explore in all their forms, through education and researc
content, interactions, and interdependencies of disciplines and insti
in the public and private sectors, both nationally and internationally

5. To make available the School's resources to business, health, g
ment, community, and other organizations in both the metropolita
and the larger community.

6. To foster understanding and advancement of knowledge and s
the world community through research, education, and scholarly exc
with governments, institutions, and organizations engaged in the s
of international trade and investment problems, and the manageme
human settlements.

Academic Status

The School of Government and Business Administration has maint
full membership in the Middle Atlantic Association of Colleges of Bu
Administration since 1961. It joined the Council on Graduate Edu
for Public Administration in 1966. In 1968, the School became a m
of the American Assembly of Collegiate Schools of Business, an
undergraduate programs are accredited by the Assembly. The pro
in accounting satisfy the educational requirements for the Certified
Accountant and Certified Management Accountant professional exa
tions. The program in health services administration is accredited
Accrediting Commission on Education for Health Services Administra
The Master of Urban and Regional Planning degree program is recog
by the American Institute of Planners.

Fellowships

The School of Government and Business Administration has s
graduate fellowships available to its students, including the Ary
Research Fellowships in International Business, Health Services Ad
tration Fellowships, Ernst and Ernst Grant to Doctoral Candida
Business or Economics, the National Association of Purchasing Man
Fellowship, the Scottish Rite Foundation Fellowships, and the W
Foundation Scholarships.

GULATIONS

ulations concerning admission, registration, fees and finances are
ed on pages 20-32; other University regulations, on pages 44-52.

endance

student may not attend classes until registration is completed and fees
are paid. A student may be dropped from any course for undue
ence.
The student is held responsible for all the work of the courses in which
istered, and all absences must be excused by the instructor in charge
ore provision is made for the student to make up the work missed.
A student suspended for any cause may not attend classes during the
iod of suspension.

thdrawal

thdrawal from a course or from the University without academic penalty
permitted during the first five weeks after registration for the fall or
ring semester. Withdrawal after this period is permitted only in unusual
cumstances, and requires certification by the instructors of courses for
ich the student is registered that the student is doing passing work (see
Withdrawal," page 46).

lding Courses

urses may not be added after the first two weeks of classes in any
mester.

dependent Study Plan

student of *demonstrated capacity*, with a special interest in the subject
tter of a course, may be permitted to undertake study under the per-
nal direction of an instructor, in accordance with the rules of the
propriate department. Credit under this plan is limited to the specific
rse credits normally allowed when taken on a class basis.

e of Correct English

y student whose written or spoken English in any course is unsatisfac-
y may be reported by the instructor to the dean. The dean may assign
plementary work, without academic credit, varying in amount with the
ds of the student. If the work prescribed is equivalent to a course, the
ular tuition fee is charged. The granting of a degree may be delayed
failure to make up such deficiency in English to the satisfaction of the
n.

mmon Body of Knowledge

grams leading to the degrees of Bachelor of Business Administration
Master of Business Administration include the equivalent of at least
year of work in the following areas:

1. a background of the concepts, processes, and institutions i
duction and marketing of goods and/or services and the financi
business enterprise or other forms of organization;
2. a background of the economic and legal environment as it p
profit and/or nonprofit organizations, along with ethical consi
and social and political influences as they affect such organizati
3. a basic understanding of the concepts and applications of ac
quantitative methods, and information systems;
4. a study of organization theory, behavior, and interpersonal c
cations;
5. a study of administrative processes under conditions of unc
including integrating analysis and policy determination of the
management level.

THE BACHELOR OF BUSINESS ADMINISTRATION DEGREE

The School offers programs leading to the degree of Bachelor of B
Administration in the fields of accounting and business administra

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the pr
of studies contemplated are required.

Requirements for admission to the freshman class include:

1. An acceptable certificate of graduation from a U.S. seco
school, showing at least 15 units* which must include four yea
English; at least two years of one foreign language; two years of sc
preferably with laboratory instruction; two years of social studies
of which must be American history; and one year of college-prepa
mathematics beyond introductory algebra. An applicant whose high s
record is deficient in any of these units cannot be admitted until suc
ficiencies are made up.

International students may be considered for admission with an eq
lent foreign secondary certificate. A student presenting a U.S. seco
certificate or its foreign equivalent must also show competence in the
lish language by scoring not less than 550 on the first taking of the T
or 600 on the second taking. International students may be requir
enroll in a full-time program in English before beginning studies in a d
program.

2. College Entrance Examination Board scores submitted on the
lastic Aptitude Test and the English Composition Achievement
(Normally, students with a SAT verbal score below 450 or a SAT
score below 500 will not be admitted.)

Criteria for admission include a strong high school record
satisfactory performance on the Scholastic Aptitude Test examina
It is recommended that the examinations be taken in Decemb
January. Scores on tests taken in the junior year may be submitte
rangements for tests are the responsibility of the applicant and sho

* A unit represents a year's study in a secondary school subject, including in the aggre
less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

e with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 0, or 1947 Center St., Berkeley, Calif. 94704, not less than one month re the date of the test. In applying for the test, the applicant should ify that the scores be sent to the Office of Admissions, George Wash- on University, Washington, D.C. 20052.

e College Entrance Examination Board tests are preferred; however, American College Testing battery scores will be accepted. The appli- should request that these scores be sent to the Office of Admissions tly from the American College Testing Program, Iowa City, Iowa. recommended that the applicant take the tests in October of the or year.

nission with Advanced Standing

uirements for admission of students transferring from other regionally redited colleges and universities and from other divisions of this versity, are as follows:

rdinarily, students who have accumulated (1) no more than 30 ester hours of transferable relevant academic credit must have a mini- m 2.00 cumulative grade index, as well as meeting the freshman re- rements; or (2) 31-60 transferable semester hours of relevant academic dit must have a 2.50 cumulative grade index or higher; students with s than 2.50 but not less than 2.00 must meet the freshman requirements; (3) 61-90 transferable semester hours of relevant academic credit must ve a 2.50 or higher cumulative grade index. Advanced standing may be arded for properly certified courses taken at regionally accredited col- es or universities for which the student received a grade of C or better, may be applied toward a degree provided they are comparable to curricular requirements of the degree.

n no case will more than 60 semester hours of advanced standing be nted for course work completed at regionally accredited community unior colleges. Courses taken at such colleges may be applied toward Bachelor of Business Administration degree provided they are com- able to BAd 161 or Mgt 118. Other courses (one course per area up to aximum of three courses), comparable to this School's courses num- ed 101-200, taken at an accredited community or junior college where a de of C or better has been earned may be accepted to waive certain ired courses. The waiver of a required course does not entitle the ent to any semester hours of credit.

lthough a grade of *D* is not acceptable for transfer of credit, the course be used to waive a curricular requirement. Credits earned with a *D* e may not, however, be counted toward the total number of semester s required for the degree. Any course completed with a grade of *D* or er may not be repeated for the purpose of earning degree credit.*

e School reserves the right to refuse credit for transfer in whole or rt or to allow credit provisionally.

is the responsibility of the student to have an official transcript sent tly from each institution formerly attended to the Office of Admis- , George Washington University, Washington, D.C. 20052.

*Exception to this rule is the freshman English composition requirement. Any student earning a grade lower than *C* in English composition at another institution may be required to repeat course(s) at this University.

A student wishing to transfer into the School from another div of this University must submit a formal application of transfer t Office of Admissions.

Courses taken at another division of this University may be ap toward a degree in this School provided they are comparable to curricular requirements of the degree. A maximum of 90 semester hou transfer credit may be applied toward a degree program in this Schoo

In no case will credit for more than 15 semester hours of undergrad course work taken at this University in nondegree status be allo toward meeting degree requirements in the School of Government Business Administration.

Readmission

A student who withdraws, is suspended or is otherwise absent from University for one semester or more must make formal application readmission. If readmitted, the student is subject to the rules and reg tions in force at the time of return. If the student has attended one more regionally accredited colleges or universities during absence from University, complete official transcripts must be sent to the Office of missions from each institution attended.

The application fee is waived for a student applying for readmission was registered as a degree candidate at the time of last registration at University and who has not since registered at another college or versity.

REQUIREMENTS FOR THE DEGREE

Academic Work Load

A full-time student not on probation may not ordinarily take more th 15 semester hours. A student employed more than 24 hours a week, wh is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or high may take up to 18 semester hours. A student employed more than 24 hou a week, whose index is 3.50 or higher, may take up to 12 semester hou

A student who accepts employment after registration or at any ti during a semester must report immediately to the Dean, so that the progra may be adjusted if necessary.

Exception to these rules will require the approval of the Dean.

An undergraduate student on probation may take no more than semester hours of course work.

Scholarship Requirements

To graduate, a student must have the following: (1) a general quality-poin index of at least 2.00 and (2) a quality-point index in the major of at leas 2.00. All courses in the Bachelor of Business Administration degree major or option are to be included in the quality-point index calculation. Electiv courses in or out of the School of Government and Business Administratio cannot be used as substitutes in the major quality-point index calculation

'S HONOR LIST

ıames of students who achieve a quality-point index of 3.50 or higher laced on the Dean's Honor List for that semester. Appearance on the ill be limited to (1) full-time students registered for a minimum of 12 ster hours and (2) part-time students registered for a minimum of 12 ster hours over a period of two consecutive semesters, which may de a summer term.

MPLETE/AUTHORIZED WITHDRAWAL

itions under which the grades of *I* (Incomplete) or *W* (Authorized drawal) may be assigned are described on page 45.
e grade of *I* must be removed no later than the last day of the ination period for the fall or spring semester immediately following emester or summer session in which the grade of *I* is assigned. An mplete" that is not removed within this period is automatically ged to an *F*. In cases of well-documented extenuating circumstances, structor and a student may jointly petition the dean, or the appro- committee, for additional time in which to complete the work of ourse. Such petitions should be submitted within the same period. grade of *I* cannot be removed by reregistering for the course here, or king its equivalent elsewhere.

ATION

ıdent whose cumulative quality-point index falls below 2.00 after leting a minimum of 12 semester hours of study will be placed on ıtion. This probation extends over the period in which the student pts 12 semester hours of work, which may include remedial studies escribed.

ENSION

dent whose quality-point index is 1.50 or below or whose index re- below 2.00 at the end of the probationary period may be suspended. dent suspended for poor scholarship may apply for readmission after ıpse of either the fall or spring semester. To be considered for re- ssion, the student must pass prescribed tests and submit evidence to ommittee on Undergraduate Studies of conduct during absence from niversity which indicates that the student will profit from readmis- A student readmitted after suspension is on probation and must main- current quality-point index of at least 2.50 on each 12 semester hours rk undertaken until the cumulative index is 2.00. In no case will the tionary period after readmission exceed 24 hours of study. A student nded twice for poor scholarship will not be readmitted.

NO PASS OPTION

ıior or senior student who has a cumulative quality-point index of

2.50 or better, may, with the approval of the advisor and the dean
one course a semester and receive a grade of *P*, Pass, or *NP*, No
which will be recorded on the student's transcript but will not be ref
in the quality-point index. No student will be allowed to take more
four pass/no pass courses. A student must sign up for such a
tion at registration. Under no circumstances may a student change
pass no pass status to graded status, or vice versa, after the en
registration. Courses required in the student's major field may no
taken on the pass/no pass basis. A transfer student may not ch
this option until the second semester of enrollment in the University.

Residence

A minimum of 30 semester hours, including at least 12 hours in the m
field, must be completed while registered in the School of Governm
and Business Administration. This requirement applies to students tr
ferring within the University, as well as to students transferring from o
institutions. Unless special permission is granted by the dean to pu
work elsewhere, the work of the senior or final year must be comple
in the School of Government and Business Administration.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable
cannot be applied toward a degree in the School of Government
Business Administration.

Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours
waive curricular requirements by performing satisfactorily on the follow
tests:

College-Level Examination Program (CLEP)—See pages 22-23 for gene
information on the CLEP tests. CLEP tests in Introductory Accounting,
troduction to Business, Commercial Law, and Data Processing are limi
to three credits each of advanced standing. CLEP tests in college algeb
trigonometry, and more advanced courses in accounting and busine
administration are not accepted for advanced standing. Students enroll
in George Washington University who wish to receive credit for CL
Subject Examinations must receive prior approval of the department.

Advanced Placement Tests—See page 22.

Achievement Tests—See pages 24.

Examinations for Waiving Curriculum Requirements—The School
Government and Business Administration does not administer waiv
examinations. However, certain arts and sciences courses may be waive
and in some instances credit may be assigned, by satisfactorily passing
special departmental examination authorized and prescribed by the de
partment or curricular advisor concerned. Requests to take the examin
tion should be made to the curricular advisor and the required fee pai
at the Office of the Cashier before the date set for the examination. See
page 77 for more information.

RRICULUM REQUIREMENTS

e hundred and twenty semester hours of course work are required for aduation. To be recommended by the Faculty for graduation, candidates e required to complete, in addition to the appropriate freshman and phomore work, a minimum of 60 semester hours (second-group course ork) in the junior and senior years selected from one of the two major ld curricula offered by the School. Courses must be taken in accordance ith the academic status of the student (i.e., freshman, sophomore, junior, nior) and with the course prerequisites. The major in accounting or busiess administration (group option) must be selected at the end of the sophoore year.

Math 3, 6, and 9 may not be used for credit towards the B.B.A. degree. irst-year foreign language courses may be used as freshman electives rovided that the student has not previously studied the language at the econdary level.

Curriculum for the First Two Years in Accounting and Business Administration

RESHMAN YEAR

		Semester Hours
Mathematics:	Math 31–32 or 51–52	6
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11*	6
Science:	BiSc 3–4; Chem 3–4; Geog 1 and 2; Geol 1–2; or Phys 9–10	6
Elective:	Courses other than accounting, business administration or economics†	6
	Total	30

OPHOMORE YEAR

Accounting:	Acct 1–2	6
Business Administration:	BAd 51	3
Humanities:	Art 31–32 or 71–72; Chin 3–4; Engl 51–52, 71–72, or 191–92; Fren 3–4 or 6, or 51–52; Germ 3–4 or 51–52; Ital 3–4; Mus 3 and 4; Phil 50, 71; Rel 9–10, 21, 22, 23, 59, 60; Slav 3–4, 5–6, or 91–92; Span 3–4 or 6, or 51–52; or SpDr 1 and 11	6
Social Sciences:	Psyc 1, 8	6
	AmCv 71–72; Anth 1–2; Hist 71–72; PSc 1 and 3 or 2 and 3; or Soc 1 and 2	6
Statistics:	Stat 51	3
	Total	30

* Engl 50 (English Composition/Research Methods for International Students) may be substituted for Engl 9 or 10, provided that a grade of *A* or *B* is received and that the student is ready to go on to Engl 11. A student who has received credit for Engl 50 may not receive credit for Engl 9 or 10.

† Restricted to lower than 100-level courses. (Courses in human kinetics and leisure studies may not be taken for credit.)

Accounting Major*

JUNIOR YEAR

Acct 101:	Cost and Budgetary Control	
Acct 121:	Intermediate Accounting	
Acct 161:	Federal Income Taxation	
Acct 191:	Advanced Accounting	
BAd 102:	Fundamentals of Management	
BAd 131:	Business Finance	
BAd 141:	Basic Marketing Management	
BAd 161:	Commercial Law	
Mgt 118:	Introduction to Information Processing	
Engl 100:	Expository Writing in Accounting	
	Total	

SENIOR YEAR

Acct 132:	Accounting Theory	
Acct 171:	Auditing	
Acct 181:	Accounting Systems	
BAd 101:	The Business Environment	
BAd 181:	Manufacturing Production	
BAd 198:	Business Policy and Administration	
Econ 121:	Money and Banking	
Stat 103:	Sampling in Accounting	
Elective:	Three semester hours selected from courses in accounting,† business administration, or economics, and three semester hours selected from courses in other departments	
	Total	

ACCOUNTING PRACTICE INTERNSHIP

An internship program, limited to selected senior accounting majors, is available during the semester break of the senior year. To be admitted to this program students must have the approval of the chairman of the Department of Accounting and must have completed at least 15 semester hours of accounting courses, including a course in auditing, by the end of the fall semester of the senior year, and a grade average of 2.9 both in accounting and overall at the start of the fall semester of the senior year. Students will be paid a salary while conducting audits under senior supervision of participating C.P.A. firms. Other internships with industry and government are available. Students who complete the internship successfully will register for Acct 199 the spring semester of their senior year and will receive three semester hours of credit. For further information consult the chairman of the Department of Accounting.

* Requirement: a cumulative grade average of 2.50 or higher at the start of the junior year.
† Qualified students accepted in the accounting internship program will elect Acct 199 in place of three semester hours of electives selected from courses in accounting, business administration, or economics.

Business Administration Major

The program in business administration is designed to provide the broad foundation required for eventual leadership in either governmental or business administration. It consists of the 36 semester hours of *required* courses; 15 hours in one of the following group options; and nine hours of electives, normally advanced courses in liberal arts subjects.

JUNIOR YEAR

		Semester Hours
Acct 193:	Business Budgeting	3
BAd 102:	Fundamentals of Management	3
BAd 105:	Personnel Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
Mgt 118:	Introduction to Information Processing	3
Group Option:	Six semester hours selected from the chosen area of specialization (see below)	6
Elective:	To be selected in consultation with the advisor	6
	Total	30

SENIOR YEAR

BAd 101:	The Business Environment	3
BAd 161:	Commercial Law	3
BAd 181:	Manufacturing Production	3
*BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
†Psyc 144:	Personnel and Industrial Psychology or	
Mgt 107:	Fundamentals of Behavioral Science	3
Group Option:	Nine semester hours selected from the chosen area of specialization	9
Elective:	To be selected in consultation with the advisor	3
	Total	30

GROUP OPTIONS

Five areas of specialization are open to business administration majors. The 15 hours taken in each of these options require the approval of the advisor. The group option and the individual courses within the option should be selected *at the beginning of the junior year*. The student should contact the Assistant Dean, Undergraduate Programs, for assignment of an advisor.

Group I: Economics

The following courses provide the basic academic foundation for such positions as financial economic analyst, industrial economic analyst, and market research analyst in business and government.

* International business majors complete BAd 178, *International Business Policy and Operations*, in lieu of BAd 198.

† Marketing option students complete BAd 146, *Consumer Behavior*, in lieu of this requirement.

BAd 132: International Business Finance
BAd 133: Capital Formation
BAd 176: International Business Theory and Policy
*Econ 101: Intermediate Microeconomic Theory
*Econ 102: Intermediate Macroeconomic Theory
Econ 158: Industrial Organization
Econ 161, 162: Public Finance I, II
Econ 181–82: International Economics
Stat 111, 112: Business and Economic Statistics I, II

Group II: Finance

The following courses provide a basic academic foundation in the major s
ments of finance: business financial management, financial markets and in
tutions, and investments. The courses provide preparation for such privat
sector positions as credit analyst, financial analyst, security analyst, tr
officer, portfolio manager, or branch manager, or such governmental positio
as financial examiner, financial analyst, and bank examiner.

*Acct 111: Financial Statement Analysis
BAd 113: Real Estate Investment
BAd 121: Fundamentals of Insurance and Risk Management
BAd 132: International Business Finance
BAd 133: Capital Formation
*BAd 138: Investment and Portfolio Management
*BAd 139: Advanced Financial Management

Group III: Information Processing

The following courses provide the basic academic foundation for positions i
information processing in government, business, and industry. They also giv
the student an understanding of the manager's use of information processing
as a vital managerial technique.

*Mgt 119: Computer Programming for Information Systems
*Mgt 120: Information Systems Development I
*Mgt 121: Information Systems Development II
*Mgt 122: Special Studies in Information Systems

One additional three-credit course, approved by the advisor, is required.

Group IV: Marketing

The following courses provide the academic and applied foundation for careers
in marketing and distribution. The marketing process involves analysis, plan
ning, and control efforts in moving goods and services from producers to ulti
mate consumers. Marketing activities are also important in the operations of
public, non-profit, and professional institutions. The course work provides the
basic academic foundation for positions such as marketing manager, sales
manager, advertising director, advertising account executive, sales promotion
manager, merchandising manager, brand manager, product development spe
cialist, market research director, and consumer affairs specialist.

*BAd 143: Marketing Research
BAd 144: International Marketing Management
*BAd 145: Sales Management

* Required for this group option.

BAd 147: Advertising
BAd 148: Seminar: Retailing Management
BAd 149: Marketing: Strategic Planning
BAd 171: Transportation and Logistics Management
BAd 175: Introduction to International Business
Jour 145: Principles and Problems of Public Relations
Stat 105: Statistics in the Behavioral Sciences
Mgt 119: Computer Programming for Information Systems

Group V: Personnel Management

The following courses provide the basic academic foundation for such positions as personnel manager, employee relations manager, and employment manager in business and government service.

*BAd 106: Leadership in Personnel Management
*BAd 107: Collective Bargaining
Jour 145: Principles and Problems of Public Relations
Psyc 129: Theories of Personality
Psyc 131: Psychological Tests
SpDr 121: Group Discussion and Conference Leadership

THE MASTER'S DEGREES

Master of Accounting—The degree of Master of Accounting is designed o provide the specialized study necessary to the preparation for a career n accounting with particular concern for professional certification. See age 196 for course requirements and degree prerequisites.

Master of Business Administration—The degree of Master of Business dministration is this School's principal professional degree in business. It s designed to develop the analytical ability and perspective which will ontribute to success as a responsible executive. Because of the increas-gly close relationship between government and business, the programs r this degree also provide an excellent background for many govern-ent careers.

Master of Public Administration—The degree of Master of Public Ad-inistration is primarily for those already in public service careers—fed-al, state, local, intergovernmental, or international—and for those seeking anagement careers in government. The program provides students with appreciation of the special requirements of public service, while at the me time helping them to improve their own analytical and decisional pabilities. The degree is interdepartmental in nature, but the major em-asis is in the Department of Public Administration.

Master of Health Services Administration—This professional degree is signed to prepare students for careers in managing and planning health rvices and in developing health-related policies. The program of study designed for health services administrators who conduct the business health services institutions and systems in both the public and private ctors at local, state, and national levels.

*Required for this group option.

Master of Science in Information Systems Technology—This specif
degree is intended to prepare students for careers in information syst
development. The curriculum is designed to develop competence in
plications programming, systems analysis and design, and technical m
agement in both the public and private sectors.

Master of Urban and Regional Planning—This professional planning
gree is designed as preparation for careers on the municipal, county, st
and national levels in both public service and private consulting practi
The program of study is planned to provide a broad education,
develop competence in planning theory and methodology, and to em
phasize the analytical ability and creativity necessary for solving urb
and regional problems.

ENTRANCE REQUIREMENTS

To be considered for admission applicants must present the followin
minimum credentials: a bachelor's degree from a regionally accredited
college or university, including at least 90 semester hours of academic
work with an overall quality-point index of 2.50 (on a 4.00 scale) and a
score of at least the 50th percentile on the applicable admission test.

Applicants whose undergraduate quality-point index is less than 2.50
or whose admission test score ranks beneath the 50th percentile may be
considered if (1) the quality-point index multiplied by 200 and added to
the admission test score equals 950 points, or (2) the upper division under-
graduate (last two years of undergraduate work) quality-point index
multiplied by 200 and added to the admissions test score equals 1,000
points.

Applicants for admission to programs leading to the degree of Master
of Business Administration must submit acceptable scores on the Graduate
Management Admission Test; applicants for admission to programs lead-
ing to the degrees of Master of Health Services Administration, Master
of Public Administration, and Master of Urban and Regional Planning
must submit scores on the Graduate Management Admission Test, the
Miller Analogies Test, or the Graduate Record Examination; applicants
for admission to the program leading to the degree of Master of Science
in Information Systems Technology must submit scores on the Graduate
Record Examination. It is the responsibility of the applicant to make
arrangements for the required test with the Educational Testing Service,
Princeton, N.J. 08540. Correspondence concerning the Graduate Manage-
ment Admission Test should be addressed to Box 966; concerning the
Graduate Record Examination, to Box 955.

Waiver of the admission test may be requested, by letter, by applicants
who meet the following criteria: (1) the undergraduate quality-point index
exceeds 3.00, (2) the undergraduate degree was conferred no more than
five years previously, and (3) the undergraduate major was a discipline
which supports the graduate program for which the application is made.
The Admissions Office will let the applicant know whether or not the
waiver will be granted.

GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of semester hours of graduate course work. A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the School of Government and Business Administration from the Division of University and Summer Students, another degree-granting division of this University, or another accredited college or university under the following conditions: the course work must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be at the graduate level, it must have been taken within the past two years, and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the dean. A transcript of the course work must be on file before the petition can be considered.

Extended programs, including undergraduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow, or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination if required in the chosen degree or concentration.

Second-group courses (numbered 101-200) may be counted toward the master's degree only when registration for graduate credit has been approved at the time of registration by the dean and the curriculum advisor. No work counted toward a bachelor's degree may be counted toward a master's degree.

Full-time students are normally expected to register for nine to 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than six semester hours. All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean.

Students who expect to continue studies for the degree of Doctor of Business Administration or Doctor of Public Administration after receiving the master's degree should ask for assistance in planning programs so that they may qualify for admission to candidacy for the doctorate.

No credit is granted for work done *in absentia* or without formal instruction, except for hospital residency, supervised field experience and the thesis, which may be completed *in absentia* with the permission of the department, curriculum advisor or committee concerned.

MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in certain degrees and fields of concentration. Degree candidates should consult faculty advisors about examinations required and material to be covered. In writing the examinations students are expected to correlate what has been learned in course work and from the literature of the field. The examinations normally require four to eight hours. Sections

broadly cover the various fields which the candidate has selected fo specialization.

Examinations are generally scheduled three times a year and shou be taken during the last semester of course registration or shortly aft completion of prescribed course work.

A written application is filed with the department supervising the st dent's field of study at the time of registration for the semester in whic the examination is to be taken. Before applying, the student must hav completed all courses in the program or be enrolled in the last semeste and must have achieved a 3.00 (*B*) average. After applying for the exam nation, a candidate may withdraw only by written notice to the depart ment chairman.

A candidate who fails the examination should consult with the faculty advisor as to a subsequent course of action.

SCHOLARSHIP REQUIREMENTS

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass *F*, Fail; *I*, Incomplete; *IP*, Progress; *CR*, Credit; *W*, Authorized Withdrawal and Z, Failure, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be balanced by a grade of *A* in a graduate course of equal status. A minimum grade-point average of 3.00 is required for award of a graduate degree. All courses taken after matriculation as a graduate student (except for *Audit* or *CR*) will be used in the calculation of the grade-point average.

A student whose quality-point index falls below 3.00 will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of *F* in a required course, and permitted to continue in graduate studies, must repeat the course and achieve at least the grade of *B*. (Such a retake does not expunge the grade of *F* and it remains part of the student's record.) Should this level of performance not be obtained, the student will be denied further registration as a degree candidate.

SUSPENSION

A graduate student who does not meet the conditions of probation (see above) will be suspended or asked to withdraw. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence which indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of

graduate study. Should the student fail to achieve this minimum quality-point index a second suspension will result and subsequent readmission will be denied.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the Dean for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible so as to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the Dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the Faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time is granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis 300, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER OF BUSINESS ADMINISTRATION

The Master of Business Administration degree is recognized as the best preparation for careers in management. The program of study leading to the Master of Business Administration provides a basic foundation in the functions of business, the environment in which it operates, and the analytical tools needed for intelligent decision-making. The program of study provides depth of understanding in one field of concentration and a broad exposure to subjects and issues at the general management level.

The program consists of 60 semester hours of course work, of which 27 may be waived if comparable study has been completed prior to admission. Thus, the minimal program is at least 33 semester hours.

The program of study consists of two levels:

First Level:

*Common Body of Knowledge Courses (30 hours)**
Econ 217–18; Acct 201; Mgt 200, 202, 218; BAd 201, 230, 240, 297.

This set of courses must be completed prior to enrollment in Second-Le courses, except for BAd 297 which should be taken in the last semester of program. All of these course requirements, except BAd 297, may be satisf by evidence of successful completion of comparable work at other institutio Common Body of Knowledge courses not completed before the applicant triculates in the School of Government and Business Administration will assigned in the letter of admission.

Second Level:

1. Breadth Courses (15 hours)
This set of courses provides exposure to a broad range of subjects intend to develop general competence in overall management. In consultation wi the advisor, the student selects five courses from at least four areas outsi the area of concentration. Thus the student has the flexibility to design a pr gram that is tailored to individual career goals.

2. Concentration Courses (12 hours)
The purpose of this set of courses is to give the student depth of understandin in a selected field. Courses are selected in consultation with the advisor an may be tailored to individual interests.

3. Elective (3 hours)
The student may select any graduate-level course to satisfy this requirement the course may be in the area of concentration or any other field.

Fields of Concentration

Students select a minimum of 12 semester hours from one of the follow ing fields of concentration.

ACCOUNTING

This field provides a contemporary, broadly based academic preparation for the field of general administration in which the manager employs ac counting as an effective means of understanding the organization. (See pages 196-97 for programs of study in accounting.)

BUSINESS, ECONOMICS, AND PUBLIC POLICY

This field is directed toward understanding, analyzing, and dealing with the principal forces shaping the total business environment. Special at-

* First-Level courses may not be taken to satisfy Second-Level requirements (breadth, area of concentration, or elective).

tention is paid to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the economy. Students concentrating in this area take courses that survey the social, legal, political, and economic environment of business and the micro- and macroeconomic foundations of government programs and of business response to these programs. Elective courses may be chosen in business representation, public decision-making, government-business liaison functions, and public administration.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than a form of substantive difference.

GENERAL MANAGEMENT SYSTEMS AND ORGANIZATIONAL CYBERNETICS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policy-maker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational and societal problems. Professional and academic career potentials are available in the following fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional/environmental interface management or consulting; (3) system-focused organization development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multi-governmental agencies such as OECD, as well as in the agencies and departments of national governments.

HUMAN SYSTEMS

This field of study reflects the assumption that the effective utilization of the behavioral sciences is concerned with both means and ends; that the

specialist in behavioral science not only is skilled in theory and rese
but also applies technical and specialized knowledge as a conscious f
in effective organizational growth and improvement. Thus, courses are
signed to equip the student with organizational concepts and behavi
skills appropriate to optimizing the utilization of a human system's t
resources.

This program helps to meet the need for professionals capable of desi
ing, creating, and developing the necessary behavioral and organizatio
systems appropriate to rapidly changing societies. Emphasis is on
interrelationships of such dimensions as motivation, leadership, proble
solving, organizational growth, and increased complexity of modern orga
zations and their effect upon the functions of organizational developme

INFORMATION SYSTEMS TECHNOLOGY

This field is designed to provide a managerial understanding of the pri
ciples of manual, mechanical, and electronic information processing, i
cluding computer programming concepts, methods, and languages; a
appreciation of the capabilities, limitations, and selection procedure o
information processing equipment; a knowledge of all phases of manage
ment information systems development, implementation, and evaluation
and an understanding of the roles of both management and systems per
sonnel in information technology. It also provides an appreciation of th
role of information systems technology as a tool of management.

Students participate in the development of management information
systems; in the selection of computer equipment; and in the installation
management, and evaluation of management information systems—during
class sessions.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in firms operating
on a multinational basis or about to enter the international field; for
careers in the federal government and in international agencies concerned
with business, industry and finance abroad; and for the commerce option
of the Foreign Service Officer Examination.

This program is also designed to provide foreign students with the back-
ground and skills necessary to promote international business, and to pre-
pare them for careers in foreign and domestic firms within their own
countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor
according to the student's background and interests.

MANAGEMENT OF SCIENCE, TECHNOLOGY, AND INNOVATION

This field explores the many aspects of technology relating to and influenc-
ing research and development management, business, and public policy.
The employment of "state-of-the-art" technology and the creation of new
technology through research and development are important processes

in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are *Marketing Management, Buyer Behavior,* and *Marketing Research.* Functional courses are *Promotion Management, Marketing Channels, Marketing Strategy,* and *Product/Service Management.* Specialized elective courses, *International Marketing, Industrial and Government Marketing,* and *Marketing and Public Policy,* utilize the resources of the Washington metropolitan area.

PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions and local, state and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations and manpower utilization.

PROCUREMENT AND CONTRACTING

This field responds to the recognized need for greater professionalism and sophistication among those engaged in procurement activities of the federal government and in contracting activities of vendors to the federal government.

The sustained increase in federal purchasing—in volume, variety, and complexity—places ever greater demands upon the skill and resourcefulness of procurement and contracting personnel. The field has therefore been designed with the following objectives: (1) to provide a broad professional education in the knowledge and skills necessary for success in this field; (2) to develop in the student increased ability in analysis, decision-making, and communications; (3) to increase the student's appreciation of the economic, social, legal and technological considerations present in procurement and contracting activity.

QUANTITATIVE ANALYSIS FOR DECISION-MAKING

This field develops a thorough understanding of quantitative or mathem cal approaches to problems of managerial control and decision-mak While the program will develop a competent background in b mathematical theory associated with the various techniques, it is orien toward applications of the techniques rather than their theoretical ma matical content.

MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration (MPA) degree program prepares t student for a professional career in public service. The 42-hour progra outlined below, is intended to provide both a generic core for all studen and specialized elective fields tailored to the interests and career o jectives of each individual student. The curriculum provides gradua instruction in all areas recommended by the Guidelines and Standard for Professional Master's Degree Programs issued by the National Associa tion of Schools of Public Affairs and Administration.

All students are required to complete an eight-course (24-semester-hour core, which includes courses in public administration and management public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the pro gram, students are required to take PAd 289 which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide him or her with deeper and broader knowledge in a field of particular interest. The elective fields generally require a four-course sequence The program is sufficiently flexible that, with the approval of a faculty advisor, the student may design a special field when none of the fields offered matches individual learning and career objectives.

Students who lack substantial knowledge of the structure and func tioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 213 *Administration in the Federal Government* or PAd 242 *Administration of State and Local Gov ernments*. The remainder of the program consists of two elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.

Because the public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

Required Courses

PUBLIC ADMINISTRATION REQUIRED CORE (24 hours)

1. PAd 205 Introduction to Public Administration and Management
2. PAd 295 Research Methods
3. PAd 296 Statistical Applications in Public Administration
4. PAd 261 Policy Analysis in Public Administration *or*
   PAd 260 Policy Formulation and Administration

5. Mgt 207 Human Behavior in Organizations
6. PAd 221 Organization Theory and the Public Sector or
   PAd 223 Behavioral Factors in Large and Complex Organizations
7. PAd 252 Public Expenditure Analysis and Planning
8. PAd 289 Public Program Management and Policy Implementation

ELECTIVE FIELDS (12 hours)*

Budget and Public Finance
Governmental Administration
Organization and Management
Policy Analysis and Evaluation
Public Personnel Administration and Manpower
Urban Administration

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 hours)

One of the following is recommended as an *introductory* course. Either of these courses may be counted as 3 of the 12 hours required in the elective field.

PAd 213 Administration in the Federal Government
PAd 242 Administration of State and Local Governments

ELECTIVE COURSES Two courses (6 hours)

Elective Fields

The six elective fields offered within the Department of Public Administration are described below. Other SGBA fields are described elsewhere. Twelve hours are required for each field.

BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of intergovernmental finance in a Federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

GOVERNMENTAL ADMINISTRATION

This field offers the student a broad understanding of some of the major functions critical to effective public management, including personnel, budgeting, and the law. For those entering the MPA program directly from an undergraduate program, this field provides insight into several po-

* Students may also elect such other standard four-course SGBA fields as: Business, Economic, and Public Policy; Human Systems; Information Systems Technology; International Business; and Quantitative Analysis for Decision-making. Students may also take an approved four-course sequence in the Department of Health Services Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification specifying the courses to be taken, and submits it by petition through the faculty advisor.

tential areas for future specialization, employment, or research. For mi career public officials, this field provides the opportunity to explore mo systematically and analytically the governmental functions they ha observed in practice.

ORGANIZATION AND MANAGEMENT

This field gives primary attention to the processes by which organiz tions are structured and their work undertaken. It includes courses organizational theory, but is also concerned with the management governmental programs. It is for students who envision careers in a ministering public sector programs.

POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processe of public decision-making, and to develop abilities to analyze and evaluat those processes. This field is most directly appropriate for those who no hold or anticipate taking staff analyst positions in government agencies, o similar positions in research or consulting firms.

PUBLIC PERSONNEL ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administratio with personnel, the staffing function of public organizations, and labo relations in the public sector. Courses are also offered in manpowe development and the use of human resources. Graduates concentratin in this field typically work in personnel administration at some level o government.

URBAN ADMINISTRATION

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of Federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

Internships

Students with little or no professional experience are strongly encouraged to take an internship during the MPA program. There are many opportunities in the Washington area for intern experiences in Federal agencies, in county and city government agencies, and in the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid, and taken for credit or not for credit. To receive academic credit, students

must have completed nine credit hours in the degree program. In general, internships for credit involve 15-20 hours of work per week for 14 weeks.

MASTER OF SCIENCE IN INFORMATION SYSTEMS TECHNOLOGY

The Master of Science in Information Systems Technology provides preparation for a career in the application of computers to the data and information problems found in organizations today. The program emphasizes a practical understanding of contemporary design and implementation approaches utilized in the development of computer-based systems. The program is currently limited to closed registration.

Degree Requirements

1. Twenty-four semester hours of common body courses or equivalents as follows: Mgt 118, 119, 120, 121, 122; Math 31, 32; Stat 114.
2. Completion of 30 semester hours of graduate course work with a QPI of 3.0, including the following courses plus 6 semester hours of electives: Mgt 241, 244, 245, 246, 247, 248, 250, 251.
3. Successful completion of a comprehensive examination.

MASTER OF URBAN AND REGIONAL PLANNING

The program of graduate study in Urban and Regional Planning leads to the professional planning degree of Master of Urban and Regional Planning. It is designed as preparation for careers on the municipal, county, state, and national levels, and for private practice. The course of study is designed to provide a broad education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Each student's program is designed in consultation with an assigned faculty advisor in accordance with individual career plans.

The degree is awarded by vote of the Faculty after satisfactory completion of (1) from 45 to 50 semester hours of course work, depending upon the background and experience of each individual student, including a thesis equivalent to six semester hours (most students will ordinarily be required to take 50 semester hours); (2) a minimum of three months' full-time professional training in a planning agency under qualified supervision, with an acceptable written report to be submitted after completion of the training period; (3) a written Master's Comprehensive Examination; and (4) a thesis based on the candidate's research in the field of urban and regional planning.

MASTER OF HEALTH SERVICES ADMINISTRATION

The program of graduate study in health services administration is designed to prepare individuals for professional careers in managing and planning health services and in developing health-related policies. These careers may be in the public or private sector and may be at the local, state, national, or international level.

The curriculum for the degree of Master of Health Services Adm
tion has two areas of concentration; however, students are encour
develop versatility and a broad perspective by taking a common
courses and by taking at least one advanced course from each
concentration. The health services management concentration s
administration of health service delivery (e.g., administration of hos
and mental health and long-term care facilities). Health services poli
planning emphasizes planning health services and policy-making rela
health. Departmental elective courses include such topics as advanc
nancial management, issues in aging, and comparative health systems
dents may also choose nondepartmental courses as electives and for
area of specialization, but advisor approval is required.

Courses required for both concentrations are: HSA 202, 203, 207,
209, 210, 212, 215, 245; Mgt 207.

Additional courses required for the health services management
centration are: two courses from the services management group,
course from the policy/planning group, one elective, and three seme
of full-time field experience.

Additional courses required for the health policy and planning con
tration are: two courses from the policy/planning group, one course f
the services management group, three courses in an area of specializa
selected by the student with advisor approval, and one semester of p
time field experience. (A research project may be substituted for the
requirement by part-time students who are employed at a professio
[managerial] level in a health services organization or agency.)

Services Management Group—HSA 231, 233, 236, 237, 238, 239.

Policy and Planning Group—HSA 221, 223, 225, 227.

Three semester hours each of undergraduate accounting, economics, a
statistics are prerequisite; prerequisites which have not been complete
prior to admission will be taken as part of the first semester's course wor
Introductory health services administration courses for beginning st
dents are taught only in the third summer session beginning in mid-July
Beginning students may register for earlier summer sessions for the pu
pose of taking prerequisites not previously completed. Each student's
program is planned with an assigned faculty advisor to assure tha
sequencing and choices of electives and courses in the concentration
groups are consistent with individual career objectives.

POST-MASTER'S GRADUATE CERTIFICATE IN HEALTH SERVICES ADMINISTRATION

Students with approved master's degrees from accredited institutions may
take a special post-master's program leading to a Post-master's Graduate
Certificate in Health Services Administration. Each program will be
planned to meet the professional needs of the individual student, whether
the student wishes to undertake a new field of study or to amplify knowl-
edge of work done at the master's level.

DOCTORAL PROGRAMS

Study for the degree of Doctor of Business Administration (DBA) and Doctor of Public Administration (DPA) is supervised by the Committee on Doctoral Studies.

Admission

The minimum admission requirement is a bachelor's degree, preferably with a major appropriate to the proposed field of study. Applicants whose degrees are in fields other than business or public administration are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are encouraged, but not required, to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Arrangements to take these tests must be made with the Educational Testing Service. Students whose native tongue is not English must also submit the Test of English as a Foreign Language (TOEFL) scores (see pages 25-26).

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

This evaluation takes three to four weeks, after which the Admissions Office notifies each applicant, through the mail, of the Committee's decision. Completed applications must be sent to the Office of the Admissions Officer, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions, and by October 1 for the spring semester. Graduates of non-U.S. universities must apply by February 1 for the fall semester and summer sessions, and by September 1 for the spring semester.

Plan of Study

The doctoral programs in both Business Administration and Public Administration consist of two major parts: the pre-dissertation stage and the dissertation stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the major and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution to the existing body of knowledge on business administration or public administration. Such a contribution can be either applied or theoretical. The total program must be finished in seven years; extensions beyond

this time limit can be given by the Committee on Doctoral Studies o under very special circumstances.

The pre-dissertation stage is based on an individual study plan develop by the student under the guidance of a major and supporting field advi during the first academic year. In the study plan the student must st long-range professional objectives, all proposed academic activiti methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the degree they seek and of the major fie of study, must include in their Study Plan Mgt 390, *Philosophical Found tions of Administrative Research*, and the multidepartmental course, 31 312, *Seminar: Public-Private Sector Institutions and Relationships*. The courses should be taken during the first academic year after admission.

In addition to the evaluation methods proposed in the study plan, th major and supporting field advisors are expected to evaluate the student progress at the end of the first and second semesters after admission, an thereafter before the end of the spring semester of each academic yea

Major and supporting fields of study include:

Accounting
Applied Economics
Finance and Investment
General Management Systems and Organizational Cybernetics
Government and Business Relations
Health Services Administration
Human Systems
Information Systems Technology
International Business
Management of Science and Technology
Marketing
Materials and Operations Management
Personnel Management
Public Administration
Quantitative Analysis for Decision-Making
Urban and Regional Planning*

A student seeking a DPA degree is required to take public administratio at least as a supporting field, to include in the study plan three doctoral level courses in public administration, and to engage in activities as specified by the field advisor.

While the major field of study must be selected from the above list supporting fields can be chosen from other departments of the University A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration see the *Handbook of the Doctoral Programs in Business Administration and Public Administration*, available in the Doctoral Programs Office.

SPECIAL PROGRAMS

Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in training carefully selected young men and women for administrative leadership in government career service. Each scholarship provides full tuition for two three-hour courses

* Can be selected only as a supporting field.

in one semester, and interns who maintain satisfactory standing in both their academic program and their government training program may qualify for a second scholarship for an additional semester.

Continuing Education in Health Services Administration

A nondegree program is conducted, both on campus and off campus, in the various areas of health services administration whenever a sufficiently large class is organized. Institutes, workshops, and lecture series are conducted under the auspices of program faculty and selected leaders from local, state, and regional areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

International Institute for Health Services Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Services Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in world-wide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

Combined Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the School of Government and Business Administration. Students must be admitted both to the National Law Center and, separately, to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Certification of Purchasing Managers

The School of Government and Business Administration participates in the three nationally recognized certification programs.

Certified Public Purchasing Officer (CPPO)
Administered by:
National Institute of Governmental Purchasing
1001 Connecticut Avenue, N.W.
Washington, D.C. 20036

Certified Professional Contracts Manager (CPCM)
Administered by:
National Contract Management Association
Crystal Plaza #1, Suite 808
2001 Jefferson Davis Highway
Arlington, Virginia 22202

Certified Purchasing Manager (CPM)
Administered by:
National Association of Purchasing Management
11 Park Place
New York, New York 10007

Bachelor of Science in Health Care Administration

A program of study leading to the degree of Bachelor of Science in Health Care Administration develops persons for beginning administrative and planning level positions in hospitals and related health organizations. At this time the degree program is limited to students in the Naval School of Hospital Administration in Bethesda, Md.

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS

Dean B.M. Sapin

FACULTY*

Professors J. Aschheim, R.H. Davison, R.M. Dunn, Jr., M. Gordon, A. Gyorgy, P.P. Hill, H.C. Hinton, M.A. Holman, A. Homayoun *(Visiting)*, C. Hsieh, J.W. Kendrick, Y. Kim, H.L. LeBlanc, R.K. Lewis, J.M. Logsdon, J.C. Lowe, J.A. Morgan, Jr., J.N. Mosél, C.A. Moser, B. Nimer, V. Petrov, H. Pollack *(Research)*, B. Reich, J.W. Robb, H.M. Sachar, B.M. Sapin, R.P. Sharkey, C.W. Shih, G. Sigur, H. Solomon, G. Stambuk, C.T. Stewart, Jr., R.B. Thompson, R. Thornton, S.J. Wayne, H.B. Yakobson
Adjunct Professors T.F. Carroll, J. Hardt, W.H. Lewis
Professorial Lecturers J.F. Coates, J.J. Dziak, E.M. Hadley, T. Hsia, B. Ramundo, T.W. Wolfe
Associate Professors R.L. Cole, C.F. Elliott, R.S. Goldfarb, W.R. Johnson, P.F. Klarén, C.A. Linden, J.K. McDonald, H.R. Nau, G.A. Olkhovsky, E.O. Pederson, L.P. Ribuffo, A.M. Yezer, R.Y. Yin
Adjunct Associate Professors V.T. Coates, A.H. Teich
Associate Professorial Lecturer P. True
Assistant Professors J. Chaves *(Visiting)*, J.J. Cordes, C.J. Deering, A.K. Fitzsimmons, D.L. Lee, C. McClintock, S. Shaffer, R. Sines, M. Sodaro *(Visiting)*, G.C.Y. Wang, S. Wolchik *(Visiting)*, D. Pollock *(Visiting)*
Instructors S.J. Carroll, E.A. Peterson

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of the School of Public and International Affairs.

Committees*

DEAN'S COUNCIL

R.L. Cole, C.F. Elliott, M. Gordon, P.P. Hill, H.C. Hinton, W.R. Johnson, C.A. Linden, J.M. Logsdon, J.K. McDonald, H.R. Nau, V. Petrov, S. Shaffer, C.W. Shih, G. Stambuk, A.H. Teich, R. Thornton

COMMITTEE ON PROGRAMS AND CURRICULUM

R.H. Davison, R.M. Dunn, Jr., A. Gyorgy, H.C. Hinton, Y. Kim, J.M. Logsdon, J.C. Lowe, B. Nimer, C.W. Shih

COMMITTEE ON ADMISSION AND ADVANCED STANDING

M. Gordon, W.R. Johnson, C.A. Linden, A.H. Teich, A.M. Yezer

COMMITTEE ON EAST ASIAN STUDIES

W.R. Johnson *(Chairman)*, H.C. Hinton, Y.C. Kim, C. Shih, G. Sigur, R. Thornton, R.Y. Yin

COMMITTEE ON RUSSIAN STUDIES

C.A. Linden, C.F. Elliott *(Chairman)*, A. Gyorgy, G.A. Olkhovsky, V. Petrov, R.B. Thompson, R. Thornton, H.B. Yakobson

COMMITTEE ON WORK-STUDY AND INTERNSHIP PROGRAMS

R.L. Cole, D. Fischer, G.C. Mackenzie

INTRODUCTION

With the establishment in 1898 of the School of Comparative Jurisprudence and Diplomacy, the study of government was first organized as a separate entity in the University. In 1928, this School was reorganized and broadened as the School of Government. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school, and the School of Public and International Affairs, a primarily policy-oriented school.

Programs of the School of Public and International Affairs are interdisciplinary, and emphasize both domestic and foreign governmental policy.

Students in the freshman and sophomore years are registered in Columbian College of Arts and Sciences, the liberal arts college of the University, and are assigned special advisors from the School of Public and International Affairs to assist them in planning their programs.

*The Dean of the School is an ex *officio* member of all committees.

Academic Programs

Programs available within the School of Public and International Affa
are undergraduate fields in Chinese Language and Literature, East As
Studies (China or Japan), and Urban Affairs; undergraduate and gradu
fields in International Affairs, Middle Eastern Studies, and Public Affai
and graduate fields in East Asian Studies, Latin American Studies, Russi
and East European Studies, Security Policy Studies, and Science, Te
nology, and Public Policy. Special programs in Soviet, Far Eastern, a
East European studies are offered by the School's Institute for Sino-Sov
Studies.

Objectives

Five undergraduate programs of study—East Asian Studies, Middle Easte
Studies, International Affairs, Public Affairs, and Urban Affairs—are aime
at preparing the student to understand major contemporary issues in i
ternational affairs or in domestic public affairs. The programs are designe
not to produce narrow professional specialists, but to foster a liberal educ
tion, interdisciplinary in nature and broader than a concentration in one
the conventional disciplines. In each program there is double effort: to d
velop a background as broad and as deep as possible in order to assist i
the understanding and analysis of modern problems and to give instructio
in some useful tools of analysis. The program in Chinese language an
literature is closer to the traditional liberal arts pattern, emphasizin
language and culture.

The graduate programs leading to the degree of Master of Arts are mor
concentrated. The student is expected to develop a greater competenc
in an area or a discipline, building on the student's undergraduate progra
in preparation for professional employment in government, in internationa
organizations, in business, or in private agencies concerned with publi
or international affairs.

REGULATIONS

Regulations concerning admission, registration, fees, and finances ar
stated on pages 20-32; other University regulations, on pages 44-52.

Attendance

Students may not attend classes until registration is completed and fee
due are paid.

Students are held responsible for all the work of the courses in which
registered, and all absences must be excused by the instructor before
provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the
period of suspension.

Withdrawal

Withdrawal after the end of the fifth week of classes (fall or spring
semester) without academic penalty is permitted only in exceptional cases
(see "Withdrawal," page 46).

THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of Chinese Language and Literature, East Asian Studies (China or Japan), Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs.

ENTRANCE REQUIREMENTS

The satisfactory completion of the Chinese Language and Literature, East Asian Studies, International Affairs, Public Affairs or Urban Affairs curriculum in Columbian College of Arts and Sciences (see pages 78-80), or the equivalent, is required.

GENERAL REQUIREMENTS FOR THE DEGREE

The following requirements apply to both the standard 120-semester-hour and the special 90-semester-hour programs. See page 170 for additional requirements for the 90-semester-hour program.

Academic Work Load

Normal academic work load for the full-time student is 15 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean.

Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in human kinetics and leisure studies cannot be included in the required hours); and (2) grades of *A* or *B* in four three-semester-hour courses in the major, to be taken in residence at George Washington University. The major includes the required second-group courses (101-200) and courses taken in the group options.

DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index* in course work is placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

* See page 45 for explanation of the quality-point index.

The rules below govern probation and suspension and are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester or the three summer sessions. For students taking less than 12 semester hours in any one semester or summer session, these rules are applied on the basis of 12 or more hours taken during two or more semesters or summer sessions.

PROBATION

Students who in one semester receive two grades of *F** in courses carrying three or more semester hours of credit each, or the equivalent, are placed on probation. Those on probation who receive one grade of *F* in such a course will be continued on probation for a second semester. Those on probation taking 12 or more semester hours whose grades are all *C* or better are removed from probation.

SUSPENSION

The following three cases constitute ground for suspension: (1) three grades of *F** in courses carrying three or more semester hours of credit or the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. Students readmitted after suspension are on probation. Those who are still on probation after completing 24 credit hours, will be suspended. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

* In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Public and International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Public and International Affairs.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

Study Abroad

Students wishing to study abroad must consult with their advisors and the dean, because arrangements must be made on an individual basis. Students should receive the dean's approval, in advance, for their plan of study abroad if they plan to have the credits earned abroad apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program should be presented for consideration together with detailed descriptions of the courses to be taken. Students of international affairs are encouraged to travel and study abroad.

Pass/No Pass Option

A student in the School of Public and International Affairs who has a cumulative quality-point index* of 2.5 or better may, with the approval of the advisor and the dean, take one course each semester and receive a grade of *P*, Pass, or *NP*, No Pass, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from pass/no pass status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *P* or *NP* is normally assigned) may not be taken on a pass/no pass basis. A transfer student may not elect to take a course on a pass/no pass basis until the second semester of enrollment in the University. Students in the School of Public and International Affairs may take no more than six courses in which the grade of *P* or *NP* is assigned, including those in which the grade of *P* or *NP* is normally given and those taken in any other college, school, or division of the University prior to transferring to the School of Public and International Affairs.

* See page 45 for explanation of the quality-point index.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree.

Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores in Columbian College of Arts and Sciences, petition the dean of the School of Public and International Affairs for admission to a special 90-semester-hour degree program in the School of Public and International Affairs. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the School of Public and International Affairs at the beginning of the junior year.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of *A* in 50 percent of the total course work, and also in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).
3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101-200) as soon as they are qualified to do so, and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

CURRICULUM REQUIREMENTS

To be recommended by the faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work (see pages 78-80), a minimum of 60 semester hours during the junior and senior years, as set forth in one of the following curricula.

Earning Credit or Waiving Requirements by Examination

For information on earning credit or waiving curriculum requirements, see Columbian College of Arts and Sciences, page 77.

Major Fields of Study

Requirements for the five major fields of study leading to the degree of Bachelor of Arts are listed below. Students should consult the appropriate department in the "Courses of Instruction" section of this *Bulletin* for complete course descriptions.

CHINESE LANGUAGE AND LITERATURE

Prerequisite—A minimum of 60 semester hours in Columbian College (see pages 78–79) or the equivalent from another accredited institution.

Requirements for the Major—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Students in the Chinese language and literature program may study abroad in the junior year.

EAST ASIAN STUDIES (China or Japan)

The major in East Asian Studies is designed to introduce the student to a non-Western culture and to provide an understanding of the history, politics, and economy of modern China or Japan. The major is interdepartmental and is recommended for students who wish a comprehensive study of one of the world's major civilizations and for those who contemplate graduate study in Chinese, Japanese, or Far Eastern affairs.

A junior year abroad is available in this program of study for those interested in China. Students should contact the chairman of the Department of East Asian Languages and Literatures.

Prerequisite—The East Asian Studies curriculum, page 79, including Chin 5–6 or Japn 3–4.

Requirements for the Major—(1) Chin 11 (China focus) or minimum of three additional hours of Japanese (Japan focus), and Chin 163 or 164; (2) Econ 169 (China focus) or 170 (Japan focus); (3) three semester hours selected from Geog 125, 126, 127, 132, 146, or 164; (4) nine hours selected from Hist 137, 187, 188, 189, 195, 196 (either Hist 187 or 196, but not both, may be selected); selection covering both pre-modern and modern periods encouraged; (5) PSc 170 or 173; (6) nine semester hours of course work in economics, history, or political science *not related* to China or Japan, to be selected in consultation with and approved by the advisor; six semester hours in research and writing seminar related to China or Japan and taken in discipline of concentration.

MIDDLE EASTERN STUDIES

The major in Middle Eastern Studies introduces the student to this region through interdepartmental studies.

Prerequisite—The Middle Eastern Studies curriculum, page 79.

Requirements for the Major—(1) six semester hours of a third year of a modern foreign language; (2) three hours of either religion, art, philosophy, or literature of the Middle East; (3) three semester hours selected from Geog 125, 126, 127, 132, 145, or 146; (4) six semester hours selected from Hist 107, 108, 109, 110, 158, 193, or 194; (5) six semester hours selected from PSc 177, 178, 179, or 180; (6) nine semester hours of course work in economics, history, or political science *not* related to the Middle East, to be selected in consultation with and approved by the advisor; six semester hours of research and writing seminar related to the Middle East and taken in the discipline of concentration.

INTERNATIONAL AFFAIRS

The major in International Affairs enables the student to specialize in international political relations, international economics, international communications, or regional studies.

Prerequisite—The International Affairs curriculum, page 79.

Requirements for the Major—(1) Econ 181–82; (2) six semester hours of a third year of foreign language (may be a literature course taught in the language); (3) three semester hours selected from Geog 125, 126, 127, 132, 135, 145, 146, or 161; (4) Hist 136, 150, or 157, and 182; (5) PSc 140 and 142 or 144; (6) 15 semester hours from one of the group options listed below:

Group I. International politics—courses concerned with theory and practice in international affairs, forces shaping the world scene, and American foreign policy, selected from Geog 125, 126, 127, 139, 146 (if not elected to satisfy the major requirement); Hist 137, 139–40, 149; PSc 105–6, 107, 108, 121, 130, 131, 146, 149, 161, 178, 182 (PSc 142 or 144 may be elected if not taken to satisfy the major requirement).

Group II. International economics—courses concerned with the world economy and American policy and practice in international trade and finance, selected from BAd 176, 178; Econ 101, 102, 104, 121, 122, 134, 147; Geog 125, 126, 127, 135; Stat 111, 112.

Group III. International communications—courses concerned with the study of international information programs, public opinion, psychological warfare, cultural relations and public relations, selected from Anth 150, 153, 157, 161, 168; Geog 106, 125; Jour 145, 146; PSc 120, 146; Psyc 115, 151, 156; Soc 144.

Group IV. Regional study—a concentration in one of the following areas: (1) Africa—courses selected from Anth 178; Hist 116; PSc 180, 181, 182; (2) Europe—courses selected from Econ 147; Hist 128–29, 131–32, 141–42, 147, 149, 151–52, 158; PSc 105–6, 130, 131, 161; (3) Far East—courses selected from Anth 173, 175; Chin 163–64; Econ 169; Geog 164; Hist 137, 187, 188, 195–96; PSc 105, 170, 173; (4) Latin America—courses selected from Anth 170, 172, 185; Econ 185; Geog 161; Hist 163–64, 165, 166; PSc 183, 184; interdisciplinary seminar 287 (PSc 285) offered by six departments participating in the Latin American Studies program; (5) Middle East—courses selected from Anth 177; Hist 158, 193, 194; PSc 177, 178, 179, 180; Rel 161; or (6) Soviet Union and Eastern Europe—courses selected from Econ 133, 134; Hist 137, 143, 145, 146, 188; PSc 108, 131 or 165, 168; Slav 161–62, 165, 166, 193–94.

PUBLIC AFFAIRS

The major in Public Affairs deals with domestic government and policy.

Prerequisite—The Public Affairs curriculum, pages 79–80.

Requirements for the Major—(1) Econ 101, 161, 162; (2) Hist 175–76; (3) PSc 114 or 115, 116 or 117, 119; (4) 12 semester hours from one of the group options listed below:

Group I. Economics—courses selected from Econ 102, 104, 121, 122, 123, 136, 142, 165, 181–82.

Group II. Politics—courses selected from PSc 106, 110, 111, 112, 116 (if not taken as a major requirement), 118, 120, 121, 122, 124, 130, 146.

Group III. Urban affairs—courses selected from BAd 174; Econ 157; Geog 140, 141, 142; PSc 111, 112; Soc 126; U&RP 153.

URBAN AFFAIRS

The Urban Affairs program is designed for undergraduates interested in urban-related occupations, in furthering their knowledge about theories and findings related to urban life, or in acquiring the tools that will help them to effectively apply themselves to the task of devising solutions to the problems that cities and their residents face. The program consists of a focused set of courses that introduces the student to the problems and issues of urban America from the perspectives of various social science disciplines.

The central focus of the program is on urban public policy—the various forces that shape it, and its adequacy relative to current and anticipated needs. Within the overall framework, students can specialize in either the political and social, economic and financial, design, or research methodological aspects of urban studies. In the senior year each student serves an internship in an urban-related agency or research organization and also attends a weekly seminar restricted to urban affairs majors. Each student is encouraged to work closely with the urban affairs advisor to develop a program tailored to personal interests and goals.

Prerequisite—The Urban Affairs curriculum, page 80.

Requirements for the Major—(1) Urban Affairs core courses: Econ 157; Geog 140; Hist 186; PSc 101, 111, 112; and one course chosen from among Stat 51, 53, or 111. (2) Special Urban Affairs fields: each student will be required to take four courses from within one of the following four fields of specialization, and two courses from each of the others. Field A. (Urban Research Methods): Stat 51, 53, or 111; Stat 112, 97, 105, 117, 123; Acct 115. Field B. (Political and Social Urban Analysis): PSc 104, 111, 113, 124; Soc 126; Soc/Econ 153; PAd 250. Field C. (Urban Economics and Financial Analysis): Econ 101, 161, 162, 165, 136; BAd 113. Field D. (Urban Design and Spatial Analysis): AmCiv 227; Geog 141, 142, 143; U&RP 153, 201. (3) Senior Internship and Seminar: PSc 188 and 193—the grade of *CR* (Credit) or *NC* (No Credit) will be given for PSc 188. A student may elect to fulfill the internship requirement in a paid position in lieu of registering for PSc 188; however, the student must substitute six semester hours of elective course work.

THE DEGREE OF MASTER OF ARTS

This School offers programs leading to the degree of Master of Arts in the major fields of East Asian Studies, International Affairs, Latin American Studies, Middle Eastern Studies, Public Affairs, Russian and East European Studies, Security Policy Studies, and Science, Technology, and Public Policy.

ADMISSION REQUIREMENTS

Application forms are available from the Graduate Admissions Office, School of Public and International Affairs, George Washington University, Washington, D.C. 20052.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in the relevant undergraduate major, is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the Aptitude Test of the Graduate Record Examinations as well as letters of recommendation are required.

In East Asian Studies—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

In International Affairs—The applicant's undergraduate program should include background courses corresponding to the interdepartmental undergraduate major in international affairs at this University (see page 172), or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

In Latin American Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University (see page 370) or equivalent. Majors in other fields may be considered for admission provided their undergraduate course work includes Spanish or Portuguese and sufficient course work in three of the following six areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

In Middle Eastern Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Middle Eastern Studies at this University (see pages 171) or equivalent.

In Public Affairs—An undergraduate major in public affairs, economics, history, or political science, depending upon the field of specialization in the master's program, is required. Students entering the program are assumed to have had some college-level course work in American government and politics, American history, and economic theory. To the extent that a student lacks such a background, the student must, in consultation with an advisor, undertake the appropriate remedial course work, including some courses which may be taken for graduate credit.

In Russian and East European Studies—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131 or 168; Slav 1–2 and 3–4, or 5–6.

In Science, Technology, and Public Policy—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences, particularly economics, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

In Security Policy Studies—An undergraduate background similar to that

specified above for International Affairs would be appropriate. Working experience in the military or national security fields might compensate in part for inadequate academic preparation. A background in economics or quantitative analysis skills would also be helpful.

Readmission

A graduate student who has not been continuously enrolled, or on approved leave of absence or inactive status, must file an application for readmission the semester before planning to return to school. Applications for readmission are reviewed by the dean and the Committee on Admission.

GENERAL REQUIREMENTS

There are two options available in all programs leading to the Master of Arts degree except Security Policy Studies, in which only the nonthesis option is available, and East Asian Studies (with a concentration in Chinese language and literature), in which only the thesis option is available. One option requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for six semester hours of *Thesis Research* (299-300). The second option requires a minimum of 36 semester hours of graduate course work and does not include a thesis. The course work for both options is taken in preparation for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an advisor-approved "Program of Studies" (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under special circumstances second-group courses (numbered 101-200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than six semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than nine semester hours may be taken for graduate credit in the 36-semester-hour program. (The one exception to this rule is the case of students who select one or more fields in history; they may take nine hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean. A student who is temporarily unable to continue the program of studies may request a leave of absence not to exceed one year.

No credit is granted for work done *in absentia* or without formal instruction, except for the thesis, which may be completed *in absentia* with the

permission of the curriculum advisor and the dean. No more than six semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may be accepted only under limited conditions of time, grades, and relevance to the student's program.

A student who expects to continue studies for the degree of Doctor of Philosophy in the field of International Relations after receiving the master's degree in the field of International Affairs is strongly advised to plan from the beginning so that work for the lower degree will fit into a subsequent doctoral program in the Graduate School of Arts and Sciences (see pages 91-93, 96-101).

Tool Requirements

In most programs of study a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the appropriate language department) of at least one modern foreign language, to be approved by the dean. A master's degree candidate whose native language is not English may not select the native language to meet the tool requirement; the candidate may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the field of Public Affairs and in the field of Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency at the level of Stat 105, 112, or 197.

Candidates in the field of International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work; it must be taken before the comprehensive examination. No student may take the language or tool examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree.

Master's Comprehensive Examination

In addition to any course examinations, the candidate must pass a written Master's Comprehensive Examination. Examinations are scheduled twice a year (usually in November and April), and should be taken during the last semester of course registration or shortly after the completion of the prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. The candidate must consult with the advisor, well in advance, as to the date of the examination and the definition of the subject-matter fields which this examination is to cover. It should be understood, however, that course work constitutes only partial preparation for the Master's Comprehensive Examination. Each student is also expected to pursue a program of additional reading in each of the

selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. An oral examination on the thesis or major report may also be required.

Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *CR*, Credit; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; and *Z*, Failure, Unauthorized Withdrawal.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status.

A master's candidate who receives a grade of *F* is required to present cause for consideration by the Dean's Council as to why the student should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an "Incomplete" cannot be made up after the lapse of one calendar year. An "Incomplete" which is not removed by the end of one calendar year remains as a grade of *I* on the student's record. An "Incomplete" cannot be removed by reregistering for the course. No student will be permitted to register for courses in a new academic year if there are more than two "Incompletes" outstanding on the record.

The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (299-300) until the thesis subject has been formally submitted to the Dean's Office. The subject must be approved by the student's advisor and the member of the Faculty under whom the thesis is to be written. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Dean's Office.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous enrollment, not to exceed one calendar year, by registering for at least one credit hour per semester. If the preparation of the thesis extends beyond the additional calendar year, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

Fields of Study

Specific requirements for each of the seven fields of study leading to the degree of Master of Arts are listed below. For prerequisites, see "Admission Requirements," pages 173-75.

EAST ASIAN STUDIES

The Master of Arts in the field of East Asian Studies is an interdisciplina program which includes course work from at least four of the follow disciplines: Chinese language and literature, economics, geography, histo and political science.

The degree program consists of 30 semester hours of course work, inclu ing six hours of thesis research, or 36 semester hours of course wo without a thesis. Each candidate must pass a Master's Comprehensiv Examination in one major and one or two minor fields. To fulfill the to requirement candidates must demonstrate proficiency in either Chines or Japanese language; with the permission of the dean, another East Asia language may be substituted. (As preparation for this requirement, special Chinese language course will be available to students in th program.)

Only the 30-semester-hour thesis option is available to students selectin a concentration in Chinese language and literature. That program include 12 semester hours of Chinese language and literature, six hours of history six hours of electives selected in consultation with the advisor, and six hours of thesis research.

INTERNATIONAL AFFAIRS

The interdisciplinary program leading to the degree of Master of Arts in the field of International Affairs provides the student with a wide choice of fields within three broad areas of study: general, supplemental or special and regional. Graduate courses in anthropology, business administration economics, geography and regional science, history, political science psychology and sociology relate to these fields, which are listed below:

General Fields of Study—International politics, comparative govern ment and politics, modern political theory (including socialist and com munist theory) and international economics.

Supplementary or Special Fields—International law; international or ganization and administration; international economic development; inter national and comparative aspects of communism; U.S. diplomatic history; U.S. foreign policy; science, technology, and public policy; 20th century British defense and foreign policy; and U.S. national security policy.

Regional Fields—Modern history, or government and politics, or eco nomic history and problems of one of the following: Western Europe, East ern Europe, the Soviet Union, Latin America, the Middle East, Africa, South and Southeast Asia and China. Within each geographical area there are normally three fields of study available.

Each degree candidate must select at least one general field. The fields should also represent at least two disciplines. Beyond these limits, the student is free to select any of the fields indicated above as long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields of study in the Master's Comprehensive Examination.

Candidates who elect to write a thesis must choose *three* of the listed fields and take, in addition to the thesis, a minimum of 24 semester hours of graduate course work in at least two departments, with no more than 15 hours in any one department.

Candidates electing a program without a thesis must choose four fields and may take no more than 21 of their required 36 semester hours in one department. They must also include in their program at least two research seminars (six semester hours) requiring the preparation of substantial research papers.

LATIN AMERICAN STUDIES

The program leading to the degree of Master of Arts in the field of Latin American Studies is designed to provide the student with an appropriate area background in three or four of the following fields: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

All degree candidates must complete 12 semester hours of graduate work, including the interdisciplinary seminar (287), in a major field selected from those listed above, and six semester hours in each of two minor fields selected from those listed above. Students who elect not to write a thesis, must take six semester hours in a third minor field selected from those listed above, or from the fields of urban and regional planning, economic development or population studies. The student must further complete an additional six semester hours in any of the major or minor fields selected. The tool requirement must be satisfied by demonstration of proficiency in Spanish or Portuguese, or in English if the student's native language is Spanish or Portuguese. The Master's Comprehensive Examination will cover all the student's selected fields.

MIDDLE EASTERN STUDIES

The interdisciplinary program leading to the degree of Master of Arts in the field of Middle Eastern Studies offers the student an appropriate area background in three or four of the following fields: domestic politics, international relations, history, economics, geography and regional science, anthropology, religion, philosophy, art, and literature. One approved field from the international affairs curriculum may also be included.

The degree program consists of 30 semester hours of course work including six hours of thesis research, or 36 semester hours of course work without a thesis. In the 30-hour program, students select one major and two minor fields; in the 36-hour program, students chose one major and three minor fields. Written Master's Comprehensive Examinations in these fields will be required of all candidates at the completion of the degree program. All students must meet the prescribed basic preparation of three credit hours in Middle Eastern international relations, domestic politics, and modern history, and must satisfactorily complete the interdisciplinary seminar offered by this program. To fulfill the tool requirement, candidates must demonstrate reading knowledge proficiency in an approved modern Middle Eastern language.

PUBLIC AFFAIRS

The program leading to the degree of Master of Arts in the field of Public Affairs allows the student to specialize in either domestic economics or

domestic politics. The student may select courses in consultation with an advisor to emphasize either political science, economics, or American history, provided (1) that no more than 15 hours of courses are elected in one department under the 24-hour program with a thesis, or (2) that no more than 21 hours are elected in one department under the 36-hour program without a thesis. Course work may include economics (public finance, monetary theory and policy, labor economics, industrial organization, natural resources and environmental economics, regional and urban economics, economic policy); history (U.S. political history, U.S. economic history, recent U.S. history); political science (domestic politics and government, Congress and the presidency, U.S. constitutional law and politics, state and urban politics, political science research methods, and science, technology, and public policy).

RUSSIAN AND EAST EUROPEAN STUDIES

This degree program is designed to give the student a broad grasp of Russian and East European affairs on an interdisciplinary basis, with emphasis on the period since 1917. The program provides an opportunity for students to gain knowledge of special areas of interest from among the following: Soviet internal and external affairs (required field of study), Soviet and Eastern European economics, ideology and thought, Russian literature and culture, Soviet military policy and strategy, 19th-century Russian history, comparative and international aspects of communism, Eastern European history, Eastern European government and politics, and advanced Soviet government, politics and foreign policy.

The degree program consists of 30 semester hours including 6 hours of thesis research, or 36 semester hours of course work without the thesis. All students must take 6 to 9 hours in the interdisciplinary field covering Soviet internal and external affairs. In the 30-hour program, students select two other fields and must include one course in Eastern European history or politics; in the 36-hour program, students select three other fields and must include one field in Eastern European history or politics. All candidates will be required to take Master's Comprehensive Examinations in these fields. Before the Comprehensive Examinations can be taken, Russian language proficiency must be demonstrated in a reading comprehensive examination. All students must have the required background preparation of at least 9 credit hours in Russian history and Soviet government and politics, and 12 credit hours in Russian language study.

Students in the concentration in Russian literature and culture may take either the thesis or non-thesis option. They must take the required field in Soviet internal and external affairs in addition to the selected fields in literature and culture. The approved fields include 19th-century Russian literature, Soviet literature, and Russian culture.

SCIENCE, TECHNOLOGY, AND PUBLIC POLICY

The program leading to the degree of Master of Arts in the field of science, technology, and public policy is flexible and is carefully planned and conducted in consultation with an advisor. All degree candidates are required

to take 12 semester hours in the core field of science, technology, and public policy, which includes course work both in science policy and in policy analysis. A second field must be chosen from one currently offered in the international affairs or public affairs programs of the School. Students who elect to write a thesis must select one additional field, and those who elect not to write a thesis must select two additional fields. The third and fourth fields may also be chosen from those currently offered in international affairs or public affairs, or may be interdisciplinary, developed in consultation with the advisor and focusing on a particular policy issue or area. Such a special field must be approved by the student's advisor and the dean.

SECURITY POLICY STUDIES

The 36-hour, four-field program leading to the degree of Master of Arts in the field of security policy studies is explicitly policy-oriented, and professional in the sense of attempting to prepare students for policy-oriented positions in the defense/national security field. A student's degree program will be carefully planned with an advisor. All degree candidates are required to take 12 semester hours in the core field of defense policy analysis. In addition, students should have a minimum competence in economics equivalent to Econ 217-18. At least one field should be selected from among the following: international security policy; military history/history of strategic thought; Soviet military policy and strategy; science, technology, and public policy; and advanced quantitative analysis. The remaining two fields are to be selected from any of the above, or from any other field offered in the School's various programs. The tool requirement must be satisfied by demonstration of proficiency in statistics or a foreign language.

SPECIAL PROGRAMS

Combined Master of Arts and Juris Doctor Degree Program

The School of Public and International Affairs cooperates with the National Law Center in offering a program leading to the combined degrees of Master of Arts and Juris Doctor. A student must be accepted for admission by both the School of Public and International Affairs and the National Law Center. Applications should be made separately, but at the same time. Both the School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the School of Public and International Affairs for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of coursework for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program which includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to six semester hours of credit for course work completed as part of

the Juris Doctor curriculum and related to the student's degree progra may be approved for transfer toward the Master of Arts degree. (Son of the course work required for the Master of Arts degree progra may be applicable toward the Juris Doctor degree requirements.) Studen will be registered in both the School of Public and International Affai and the National Law Center and must maintain this concurrent registr tion until all degree requirements have been completed. All work for th combined degree program must be completed in five years, unless a extension of time is granted by the dean.

Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialize graduate study and research within the School of Public and Internationa Affairs. Courses of the Institute are drawn from a variety of academi areas and thus provide an interdisciplinary approach to the study of th Soviet Union, Eastern Europe, and East Asia, and of the Communist move ment within and among the countries of these areas. Faculty member conduct seminars and reading courses in the disciplines of economics geography, history, language and literature, law, political science, and psychology. Research work is integrated with the teaching program.

Students who are preparing for the degree of Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies in the School of Public and International Affairs, or for the degree of Master of Arts in the fields of economics, history, or political science in the Graduate School of Arts and Sciences, with specialization in Sino-Soviet studies, may take course work from the Institute's offerings.

Students working toward the degree of Doctor of Philosophy in international relations with special emphasis on the Sino-Soviet area are expected to combine work in the Institute with work in the fields of economics, history, and political science. Doctoral candidates in the field of political science will take their Sino-Soviet work in the form of appropriate sub-fields of the major and minor fields. Doctoral candidates in the field of history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences and consultative committees designated by that School which direct the work of each graduate student upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. A candidate for such a degree should assume that the committee will require the substitution of a reading examination in Chinese or Russian for one of the two Western languages normally required for the degree.

A brochure describing in more detail the work of the Institute is available upon request.

DIVISION OF UNIVERSITY AND SUMMER STUDENTS

Dean W.F.E. Long
Assistant Dean S.R. Paratore

INTRODUCTION

The Division of University and Summer Students makes courses available to those who are not currently degree candidates at this University. Such students, often employed in government or industry, may be taking courses to increase their vocational fitness or as a matter of personal interest. They may be candidates for higher degrees in other institutions, sent here for special work as part of a graduate program. They may be undergraduates matriculated elsewhere, taking courses for transfer to their own institution.

All courses except those restricted to medical and law students and certain courses in the School of Government and Business Administration are open to students enrolled in the Division, provided they have sufficient preparation as determined by the academic departments. Students wishing to take engineering and applied science courses should consult the *School of Engineering and Applied Science Bulletin*.

Registration in a given course may be denied students in this Division when space is needed for degree candidates. Students in this Division are not eligible to register for thesis or dissertation research. This Division requires a minimum registration of three semester hours per semester or session.

ENTRANCE REQUIREMENTS*

An academic background appropriate for the program of studies contemplated is required. In addition, the applicant who has previously attended this or another college or university must be in good standing at that institution. An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission to the Division for one calendar year after the effective date of the suspension. An applicant who has been denied admission elsewhere within this University may be considered for admission to the Division upon recommendation of the appropriate department and school or college.

Applications for admission to the Division during a fall or spring semester must be received no later than the Friday before the first day of registration (see the Calendar, pages 5-7). Applications for admission to the Division during the summer should be submitted at least two working days prior to registration day. In both cases, however, applicants are urged to apply earlier. There is no application fee.

* For admission requirements for students from foreign institutions, see pages 25-26.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stat
on pages 20-32; other University regulations, on pages 44-52.

Prospective and registered students are urged to acquaint themselv
with the regulations concerning attendance (see page 44) and withdraw
(see page 46).

The following specifically apply to all students in the Division of Un
versity and Summer Students:

Last day to add a class for credit—end of first week of classes.

Last day to drop a class for credit or to withdraw from the University
end of the ninth week of classes.

Equivalent amounts of time apply to the summer sessions.

Academic Work Load

The normal academic work load during the regular academic year is no
more than 10 semester hours for a student employed more than 20 hour
per week and not more than 18 semester hours for a full-time student
During the summer a student may take a maximum of two courses durin
any one session. Exceptions to these limits must be approved by the dean

Scholarship Requirements

A student who fails to maintain the scholarship requirements of this
Division may be dismissed from the University.

All grades received in the Division of University and Summer Students
remain on the record, and scholarship requirements are based on the
total record.

Grades

Undergraduate—*A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*,
Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure,
Unauthorized Withdrawal.

Graduate—For graduate work, grades are indicated as *A*, Excellent; *B*,
Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Author-
ized Withdrawal; *Z*, Failure, Unauthorized Withdrawal; *CR*, Credit.

For both undergraduate and graduate courses there is also a pass/no
pass option, which permits students to take courses in which they receive
the grade of either *P*, Pass, or *NP*, No Pass. There is no limitation on the
number of courses that may be taken pass/no pass in this Division; how-
ever there may be a limit on the number that can be transferred to fulfill
degree requirements.

Incomplete/Authorized Withdrawal

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized
Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The instructor normally sets a period (maxi-
mum of one year) within which the uncompleted work must be made up.
An Incomplete which is not removed within one calendar year remains as
a grade of *I* on the student's record.

Change in Program of Studies

Change within the Division of University and Summer Students—A student may not change or drop courses (see "Withdrawal," page 46) or change status to that of auditor except with the approval of the dean.

Change from one section to another of the same course may be made with the approval of the dean and the department concerned.

Transfer within the University—Transfer to or from the Division of University and Summer Students may be made only with the approval of the deans concerned.

Application for transfer to degree candidacy will be considered only after the completion of at least one semester in the Division or upon request from the college or school to which the student is seeking admission.

Students wishing to transfer to degree candidacy must meet the conditions of the college or school to which they are applying. It is the responsibility of the student to consult the relevant degree-granting college or school concerning all conditions to be met and the amount of work transferable.

THE SUMMER SESSIONS

During the summer of 1980, Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Government and Business Administration, the School of Public and International Affairs, the School of Engineering and Applied Science, the Division of University and Summer Students, and the School of Medicine and Health Sciences offer courses in one three-week session (May 12-June 4) and two five-week sessions (June 9-July 15 and July 16-August 20). The National Law Center offers courses in two six-week sessions and one 13-week session; the School of Education and Human Development offers courses in three- and six-week sessions. The University also offers special programs during the summer which are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the 1980 spring semester may register for the Summer Sessions without special application. All others must apply for admission or readmission. There is no application fee. Students who wish degree status may seek admission from the appropriate college or school within the University. Those who do not wish to work toward a degree at the University may apply through this Division. Such students should also read the sections on Entrance Requirements and Regulations.

For a complete statement concerning summer term work, see the *Summer Sessions Schedule of Classes*.

COLLEGE PROGRAM FOR SECONDARY-SCHOOL STUDENTS

The George Washington University College Program for Secondary-School Students provides the promising high-school student an opportunity to take fully accredited college courses along with college students.

To take advantage of the University's unique location in the natio capital, a diversified cultural and recreational program is arranged. portunities for observation, study, service, and recreation are limi only by the student's time, energy, and imagination.

Courses are available full-time during the Summer Sessions to eligi students and part-time throughout the year to eligible commuting stude concurrently with their high-school program. Dormitory residence spa is not provided for part-time students.

Secondary-school students with outstanding records may apply for summer scholarship which covers approximately half of the total cost room and board, tuition, the recreational-cultural program, health se vices, and Marvin Center fees. During the fall and spring semesters, co muting students with outstanding records may apply for a scholarshi covering half of tuition costs for courses to be taken concurrently wit secondary-school courses. The approval of the applicant's principal o guidance counselor is necessary. A transcript of the applicant's grades t date, including available standard test scores, is required.

Application forms and further information may be obtained by writin to the College Program for Secondary-School Students, Admissions Office George Washington University, Washington, D.C. 20052.

DIVISION OF EXPERIMENTAL PROGRAMS

Director R.S. French
Assistant Directors L.J. Lear, P.E. Wallace, Jr.

The University is committed to the continuous development of new curricular options for its faculty and students. The Division of Experimental Programs has as its function the support of such curricular experimentation and development. This University-wide curricular development program has three objectives: (1) cooperation among the academic divisions of the University in the development and sponsorship of new courses and programs; (2) experimentation with new ways of teaching and learning; and (3) a more direct relationship between campus and off-campus resources and interests. In pursuit of these objectives the Division awards faculty fellowships for interdisciplinary research, sponsors student-faculty societies for interdisciplinary education, and regularly organizes regional conferences on educational issues. The Division supports an annual conference on local history, publishes a monograph series, *GW Washington Studies*, and sponsors each academic year the Banneker Visiting Professor of Washington Studies.

Under the auspices of the Division of Experimental Programs, students, faculty, and administrators throughout the University are involved in the

planning, teaching, and evaluating of experimental courses and degree programs. Many curricular experiments which receive financial support through the Division of Experimental Programs are sponsored by other academic units of the University, e.g., the 700 Series of Courses in General and Interdisciplinary Studies. There are presently two academic programs directly sponsored by the Division—the Program in Experimental Humanities and the Service-Learning Program.

The Program in Experimental Humanities offers courses which provide opportunities for students to combine sustained field study with classroom work. These courses are sometimes taught by interdisciplinary and interdivisional faculty teams. Some Experimental Humanities courses are residential courses in which students enrolled in the same class also live together in designated areas of university housing.

The Service-Learning Program integrates off-campus, preprofessional work placements with classroom seminars. Students in the program are placed in community groups, research organizations, or governmental agencies. Assignments are arranged by means of a formal agreement among the student, the program, and the off-campus placement. Instructors in the seminars are members of the faculty in one of the professional schools of the University.

The Division of Experimental Programs is charged with mobilizing academic resources throughout the University that can appropriately address needs in the Washington metropolitan community. Among the activities of the Division is a community assistance program in the Anacostia area. Selected students receive stipends for services to residents and work with community organizations.

ASSOCIATES

Allan Fitzsimmons, *Faculty Associate for Environmental Studies*
Margot Kernan, *Faculty Associate for Film Studies*
Thelma Z. Lavine, *Faculty Associate for Interdisciplinary Studies*
D. Joanne Lynn, *Faculty Associate for Humanities and Medicine*

STEERING COMMITTEE

Harold Frederick Bright, *Provost and Vice President for Academic Affairs, Chairman*
Lawrence Thompson Bowles, *Dean for Academic Affairs of the Medical Center*
Marcella Brenner, *Professor of Education*
Carl James Lange, *Professor of Psychology; Vice President for Administration and Research*
Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
Ralph Clarke Nash, *Professor of Law*
Judith Ann Abrams Plotz, *Associate Professor of English*
Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*

POLICY STUDIES AND SPECIAL PROJECTS

Vice President for Policy Studies and Special Projects L.H. Mayo

The Vice President for Policy Studies and Special Projects is responsible to the President of the University for developing an interdisciplinary capability for analyzing national policy issues. There is involvement with the Consortium universities and with foundations, federal agencies, industry, and other organizations which interact with the governmental process.

The office serves the University as a locus for discussion and as an advisory resource on interdepartmental and interdisciplinary research related to the analysis of public policies, and on curricula pertaining to broad social or environmental problems.

The University has sustained an institutional commitment, in terms of faculty recruitment and program emphasis, to issue-oriented policy analysis as a major focus of teaching and research activities. The result of thirteen years of development is a significant, institutional capability for comprehensive analysis of complex policy issues. Major programs oriented to public policy and governmental functions, which come within the ambit of this office, are described below.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

Director L.H. Mayo

The Program's primary objective is the continuing development of a University-wide policy research capability related to problems stemming from the impact of technological change on the processes, values, and institutions of society. The Program provides a neutral forum for consideration of these policy issues—whether in a retrospective, current, or prospective context—and provides an advisory and research resource for policy makers in the public and private sectors.

The Program's primary components are:

1. *The Technology Assessment Group*—The Program has been closely involved with the evolution of the concept of Technology Assessment (TA), which has become federally institutionalized in the Congressional Office of Technology Assessment. Much of the early work of the Program consisted of theoretical, methodological, institutional, and historical studies. During the last seven years, however, the TA Group has carried out studies in a variety of subject areas including transportation, energy, community development, environmental noise, communication, and governmental structure and process, under contracts or grants from most of the major Federal agencies.

2. *The Graduate Program in Science, Technology, and Public Policy*—This Master's degree program—co-sponsored by the Program of Policy Studies and the School of Public and International Affairs (SPIA)—combines graduate training in science policy analysis with major research under-

takings. In six years, the program has become the largest degree-granting science policy program in the United States. Admissions information is contained in the SPIA section of this *Bulletin*.

3. *The Behavioral Studies Group*—This part of the Program focuses on the social and behavioral factors associated with technological development. It is a multidisciplinary group, with expertise in motivational and behavioral aspects of technology assessment in the areas of transportation, energy use, communication, energy conservation, new town program development, public health (family planning, community mental health), and education. Work includes applications of TA to program development and evaluation, as well as to dissemination and utilization of strategies to improve the constructive uses of technologies in these areas.

The Program of Policy Studies normally has between 15 and 20 professionals and many students working on several projects, most of which are problem-oriented and interdisciplinary in nature. Members of the faculty, graduate students, members of governmental agencies, and special consultants are regularly involved in our studies. To date the Program has performed over 75 policy studies and has published over 100 reports, monographs, books, and special papers which have been distributed to professionals and institutions throughout the world. Funding for the Program's activities has come from a variety of sources: the University; federal agencies, including DOT, EPA, ERDA, HEW, HUD, NASA, Commerce, OTA, and NSF; and private foundations, including The Ford Foundation.

Professional Associates

Director Louis H. Mayo, *Vice President for Policy Studies and Special Projects; Professor of Law*
Robert W. Anthony, *Senior Staff Scientist (Physics, Systems Modeling)*
Guy Black, *Professor of Business Economics*
James M. Brown, *Senior Staff Scientist; Professor of Law*
Richard Ericson, *Senior Staff Scientist; Professor of Management*
Henry B. Freedman, *Research Associate (Business Administration)*
James U. Hamersley, *Research Associate (Law)*
Henry H. Hitchcock, *Research Associate (International Relations)*
Charles V. Kidd, *Senior Staff Scientist (Public Affairs)*
John M. Logsdon, *Research Scientist; Director, Graduate Program in Science, Technology, and Public Policy; Professor of Public Affairs and Political Science*
Joseph B. Margolin, *Senior Staff Scientist; Director, Behavioral Studies Group*
Milton C. Marney, *Consultant (Normative Systems Research)*
Marion R. Misch, *Research Scientist; Deputy Director, Behavioral Studies Group*
Henry R. Nau, *Graduate Program in Science, Technology, and Public Policy; Associate Professor of Political Science and International Affairs*
Herman Pollack, *Research Professor of International Affairs (Political Science)*
Ernest Weiss, *Senior Staff Scientist (Transportation Programs Specialist)*

NATIONAL HEALTH POLICY FORUM

Judith K. Miller, *Director*
Marion Ein, *Associate Director*

The National Health Policy Forum assists professional staff members employed by the executive and legislative branches of the federal government in the health field to obtain a more realistic understanding of actual health practices and problems, and to improve communications between Washington-based professional staff members and experts in the field. Exposure to problems and issues facing the entire country is gained primarily through sequenced evening discussions or workshops and, where appropriate, site visits to various localities. Although attendance is primarily limited to Congressional aides and top-level health staff from the many government agencies involved in health, GWU students and faculty can be accommodated on a space-available basis.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

Samuel Halperin, *Director*
Paul Schindler, *Director, Education Policy Fellowship Program*
Elizabeth Hale, *Associate Director*
Jerome Contee, *Assistant Director*
Harriet Bernstein, *Acting Director, Educational Staff Seminar*
Philip Kearney, *Coordinator and IEL Associate Director for State Programs, The Associates Program*
John Merrow, *Producer, "Options in Education"*
A. Sidney Johnson III, *Director, Family Impact Seminar*
Theodora Ooms, *Deputy Director*
Ruth Hubbell, *Associate Director for Research*
George Kaplan, *Coordinator, Washington Policy Seminar*
Diane Brundage, *Coordinator of Communications and of Journalism Programs*
Lisa Walker, *Coordinator, Education of the Handicapped Policy Project*
Dietra Norris, *Chief Administrative Officer*
Patrick Barbati, *Director, Financial Services*

The Institute for Educational Leadership (IEL) seeks to strengthen present and potential leadership in American education at the policy levels of state and federal government. Established in 1971, IEL is a policy planning and coordinating agency for a number of related educational programs, including Education Policy Fellowship Program, Educational Staff Seminar, The Associates Program, "Options in Education" over National Public Radio, Washington Policy Seminar, Family Impact Seminar, and Ford Fellows in Educational Journalism. IEL is supported by a major grant from The Ford Foundation and by various grants from foundations and federal agencies.

The objectives of the Institute are carried out under the following programs and activities:

1. *Education Policy Fellowship Program* (formerly Washington Internships in Education) is a national program designed to help provide future educational leaders with skills in policymaking for effective and enlightened leadership. Funds for the program are provided by the Ford

Rockefeller, and Cleveland Foundations. Since 1964, the program has placed over 550 mid-career persons in one-year internships in public and private agencies involved in educational policy matters.

2. *Educational Staff Seminar* is a professional development program designed for staff members employed by the executive and legislative branches of the federal government in the field of education. It is designed to expose these federal education policymakers to existing programs throughout the nation, and to innovations, research, and emerging ideas in the field.

3. *The Associates Program* is an evolving IEL activity. Its emphasis has been to provide seminars for legislators and other policymakers at state capitals. Begun in 1972 with three state educational seminars, the Program now sponsors 31 seminars, all directed by Associates who arrange five to ten programs annually.

The Program maintains a network of state-level "generalists" (Associates) whose ties to IEL in the nation's capital provide rare linkages among federal and state education policy-setters. It also sponsors national and regional conferences dealing with state-level responsibilities in education.

4. *"Options in Education,"* co-produced by IEL and National Public Radio, is a weekly series heard over most of NPR's 190 member stations from coast to coast. Voice of America rebroadcasts the one-hour programs, and IEL makes cassettes and transcripts available at minimum cost. "Options" has received awards from the National Association of State Department of Education Information Officers (1977), the Education Writers Association (1975 and 1976), and the Council for Advancement and Support of Education (1974). A list of NPR member stations and a catalog of available cassettes and transcripts are available from IEL.

5. *Family Impact Seminar* seeks to identify and assess the effect on families and children of a variety of public policies. The Seminar and its several task forces are composed of scholars and policymakers. Together, they examine and test the feasibility of developing "family impact statements" on selected government policies and programs. The specific issues to be examined are selected from a broad range of existing or proposed public policies.

6. *Ford Fellows in Educational Journalism* is an intensive, short-term professional development program for educational reporters and journalists. This pioneering effort has offered 41 Fellows a "sabbatical" from the fast-paced immediacy of daily educational reporting and allows them to pursue a full-time, three-month course of independent study in their designated area of educational interest. The program reflects the conviction that better-informed media will be a direct and positive influence for better education.

7. *The Washington Policy Seminar* brings groups of state educators and policymakers to the Capital for three days of intensive exposure to the processes, people, and institutions which shape federal education policy. Speakers for the Seminar include members of Congress, Congressional staff, senior officials of the Executive branch, leaders of education associations, and seasoned "Washington watchers."

Further information on these programs is available from the Institute for Educational Leadership, Suite 310, 1001 Connecticut Ave., N.W., Washington, D.C. 20036.

SPONSORED RESEARCH

Vice President for Administration and Research C.J. Lange

These special programs were established for the specific purpose of considering, in an academic atmosphere, problems proposed by the individual projects or submitted by the sponsoring agency. Cooperation between these programs and the various departments of instruction is as close as the nature and needs of the programs and departments will permit.

CENTER FOR SOCIAL POLICY STUDIES

Director Sar Levitan

The Center for Social Policy Studies is devoted to the evaluation of federally-supported manpower, antipoverty and related programs. The Center is financed by a grant from the Ford Foundation and offers, in conjunction with the Department of Economics, graduate courses in labor economics and social policy.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) CLEARINGHOUSE ON HIGHER EDUCATION

Director Jonathan Fife

The Educational Resources Information Center (ERIC) Clearinghouse on Higher Education, established in the fall of 1968, is supported by the National Institute of Education. The Clearinghouse is responsible for the acquisition, evaluation, abstracting, indexing and dissemination of research reports and other documents dealing with problems and issues in higher education, prepares state-of-the-art and review papers related to higher education and responds to individual inquires concerned with higher education.

NATIONAL HEALTH POLICY FORUM

See Policy Studies and Special Projects, page 190.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

See Policy Studies and Special Projects, pages 190-91.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

Director W.H. Marlow

The Institute for Management Science and Engineering provides a multidisciplinary environment for innovative graduate teaching and substantial

opportunities for research activities and public service under diversified sources of external support. Through its Program in Logistics, the Institute performs research leading to the development of a science in logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts.

MID-EAST REGIONAL RESOURCE CENTER

Director Raymond Cottrell
Associate Director Nona Flynn

The Mid-East Regional Resource Center is one of a number of centers serving under contract to the Bureau of Education for the Handicapped, U. S. Office of Education. The area served includes Delaware, Maryland, West Virginia, and North Carolina. The primary mission of the project is to assist state education agencies and affiliated agencies within its area to comply with the Individualized Educational Programming requirements of Public Law 94-142.

NATURAL RESOURCES POLICY CENTER

Director Mary Holman

The Natural Resources Policy Center was established in September, 1965, to sponsor faculty and student research in the area of natural resources and environmental quality; to develop and undertake activities that promote undergraduate and graduate education; and to train employees of public resource agencies. The program of the Center focuses particularly on increasing the contribution of the social sciences to the solution of contemporary problems relating to the management and development of natural resources. The Natural Resources Policy Center, which provides a focus on natural resource and environmental quality problems and issues, is an integral part of the Department of Economics in both the design of its research program and its courses.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

See Policy Studies and Special Projects, pages 188-89.

SOCIAL RESEARCH GROUP

Director Ira Cisin
Associate Director H.J. Parry

The Social Research Group conducts surveys and experiments with concentration on basic research underlying an approach to the solution of social problems.

COURSES OF INSTRUCTION

The following pages contain listings and descriptions of courses offered the departments of instruction and special interdepartmental programs. courses as here listed are subject to change. The University reserves right to withdraw any course announced or to change the course shown herein.

HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Even and daytime sections of the same course are identical, are taught by same staff of instructors and carry the same amount of credit.

EXPLANATION OF COURSE NUMBERS

First-group courses—Courses numbered from 1 to 100 are planned students in the freshman and sophomore years. With the approval of advisor and the dean, they may also be taken by juniors and seniors. certain instances, they may be taken by graduate students to make undergraduate deficiencies or as prerequisites to advanced courses, they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work receive graduate credit. Accounting courses numbered 101-200 may not be taken for graduate credit.

Third-group courses—Courses numbered from 201 to 300 in the Graduate School of Arts and Sciences and the School of Government and Business Administration, and courses numbered 201 to 400 in the School of Education and Human Development, are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Non-degree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

Fourth-group courses—Courses numbered 301 to 400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301 to 400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 401 to 500, are limited to graduate students with master's degrees from accredited institutions.

Fifth-group courses—Courses numbered 701 and 721 explore topics not normally included in departmental offerings and utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 701 number is used to designate courses taught by an individual faculty member; the 721 number is used to designate upper-level courses in which faculty from two or more departments investigate a topic of mutual academic interest.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opht	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
RSci	Radiological Sciences
Rad	Radiology
RPol	Regulatory Policy

Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the *Summer Sessions Schedule of Classes* for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

ACCOUNTING

Professors E.J.B. Lewis, A.J. Mastro *(Chairman)*, F.C. Kurtz, C.M. Paik, M.G. Gallagher
Professorial Lecturers J. Hilmy, F.W. Segel
Associate Professor G. Bodnar
Associate Professorial Lecturers E. McReady, T.B. Cooke
Assistant Professor P. Welling
Assistant Professorial Lecturer J.D. D'Amore
Adjunct Instructors G.E. Farrelly, A.C. Riley, J.A. Talbot

Bachelor of Business Administration in the field of accounting—See pages 137–44.

Master of Accounting—Required: the general requirements, pages 149–51. All candidates are required to complete 30 semester hours of graduate course work—Acct 211, 221, 232, 251, 261, 263, 264, 275, 282, and Mgt 247—and a comprehensive examination in the final semester of course work or the following semester. A maximum of 6 semester hours may be approved for transfer into the program. Specific prerequisite courses will vary, based on the student's status upon admission to the program.

Master of Business Administration with a concentration in accounting—Prerequisite: A bachelor's degree, see page 148. Required: the general requirements, pages 149–52; common body of knowledge courses or course equivalents: Acct 201; BAd 201, 230, 240, 297; Econ 217, 218; Mgt 200, 202, 218. General instruction in administration courses: BAd 202, 211, 255; Mgt 204; and six semester hours of electives, within the School of Government and Business Administration, selected with the approval of the advisor from courses outside the field of concentration of accounting, with only three credits from any one field. Concentration courses: Acct 220, 262, 276, 277, and a comprehensive examination in the final semester of course work or the following semester. (Note: BAd 297 cannot be waived in the common body of knowledge course area by a prior similar course.)

Doctor of Business Administration and Doctor of Public Administration, see pages 161–62. Students admitted to the doctoral program with accounting as the major field may be considered for concurrent appointments as Adjunct Instructors. Criteria for selection include a Master's degree and a C.P.A. Courses to be taught are restricted to Acct 1 and 2. See Chairman of the Accounting Department for details.

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 200 and above may not be taken for undergraduate credit.

First Group

1–2 Introductory Accounting (3–3) Gallagher, Kurtz

Basic understanding of accounting concepts, procedures, analyses and reports; the accounting measurement and communications of significant economic and financial data. There is a $25 laboratory fee for Acct 1. Prerequisite: sophomore status. Acct 1 is prerequisite to Acct 2. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 1. (Acct 1 and 2—fall and spring)

Second Group

101 Cost and Budgetary Control (3) Bodnar

Cost behavior and volume-profit relationships, responsibility accounting, standard costs, flexible budgets, cost structures for control and motivation, relevant costs, cost concepts. Prerequisite: Acct 1–2 and junior status. Students who have received credit for Acct 193 cannot receive credit for Acct 101. (Fall and spring)

111 Financial Statement Analysis (3) Hilmy

Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 1–2. (Fall and spring)

121 Intermediate Accounting (3) Mastro

In-depth study of accounting functions and basic theory; acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 1–2 and junior status. Laboratory fee, $25. (Fall)

132 **Accounting Theory** (3) Mast

Current thought as reflected in the pronouncements of leading pr fessional and accounting research associations, major contributio to accounting literature. Prerequisite: Acct 121 and senior statu (Spring)

141 **Governmental Accounting** (3) Lew

Appropriation, encumbrance, and fund accounting for governmenta and institutional entities. Prerequisite: Acct 1–2. (Fall)

161 **Federal Income Taxation** (3) Gallagh

Federal income tax concepts applicable to individuals and corpora tions, differences between tax accounting and financial accounting (Fall and spring)

171 **Auditing** (3) Kurt

Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, form-prepa ration-use of audit work papers, audit evidence. Prerequisite: Acct 121 and senior status. (Fall)

181 **Accounting Systems** (3) Bodna

Data processing considerations in the design and operation of ac counting systems. Principles of internal control applicable to manua and automated accounting systems. Prerequisite: Acct 101, 171, and senior status. (Spring)

191 **Advanced Accounting** (3) Gallagher

Application of accounting theory to special areas: consolidated state ments, business combinations, earnings per share, foreign exchange price-level adjusted statements, source and application of funds Prerequisite: Acct 121, and junior status. (Spring)

193 **Business Budgeting** (3) Lewis

Principles and procedures in the development, installation, and opera tion of a system of budgetary control to aid management. Prerequi site: Acct 1–2. Students who have received credit for Acct 101 cannot receive credit for Acct 193. (Fall and spring)

199 **Accounting Practice Internship** (3) Mastro

Concepts, procedures and standards of auditing practice obtained as an intern with a firm or agency. Prerequisite: 15 semester hours of accounting courses (including a course in auditing), senior status, and approval of the chairman of the department. (Spring)

Third Group

201 **Financial Accounting** (3) Kurtz

For designated students in the M.B.A. program. The role of account ing in the decision-making process of external parties; the understand ing, interpretation, and implementation of financial accounting (Course equivalent: a similar graduate financial accounting course, or Acct 1 and 2, or two similar undergraduate courses.) (Fall and spring)

211 **Business Law For Accountants** (3) Gallagher

A study of the legal process and of the principles and precepts of business law; corporations, partnerships, property, trusts, wills, and the legal liability of the accountant. Prerequisite: Master of Accounting status. (Fall)

220 **Management Accounting** (3) Paik

The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation decisions in the organization. Prerequisite: Acct 201. (Fall and spring)

221 **Cost Analysis** (3) Bodnar

An advanced cost accounting course with emphasis on comparative costs and cost accounting standards. Prerequisite: Master of Accounting status. (Spring)

232 **Generally Accepted Accounting Standards** (3) Mastro

A critical understanding of the Financial Accounting Standards Board Pronouncements (Standards) and the Security and Exchange Commission—Accounting Series Releases. Prerequisite: Master of Accounting status. (Spring)

251 **Accounting For Multinational Corporations** (3) Segel

A study of international accounting standards with emphasis on accounting for foreign conversion requirements compatible with domestic accounting consolidation standards. Prerequisite: Acct 201 and 220. (Fall)

261 **Federal Income Taxation of Individuals** (3) Gallagher

A study of federal income taxation of individuals covering gross income, deductions and credits, sales, other disposition of property, capital gains and losses, and timing. Prerequisite: Master of Accounting status. (Fall)

262 **Business Income Taxation** (3) Gallagher

Federal income tax concepts applicable to corporations, partnerships, and their owners; emphasis on tax planning factors in business decisions and tax research. (Fall and spring)

263 **Federal Income Taxation of Corporations** (3) Gallagher

A study of federal income taxation of corporations, covering capital structure, distributions not in and in complete liquidation, and corporate accumulations. Prerequisite: Master of Accounting status or departmental approval, and Acct 261. (Spring)

264 **Federal Taxation of Estates, Gifts, and Trusts** (3) Gallagher

A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Master of Accounting status or departmental approval, and Acct 261. (Spring)

275 **Contemporary Auditing Theory and Procedures** (3) Kurtz

Study of auditing concepts: generally accepted auditing standards, application of statistical sampling to auditing, audit of electronic data processing systems. Prerequisite: Master of Accounting status. (Spring)

276 **Management Planning and Control** (3) Pai

Integrative case study approach to management systems for pla ning, control, and decisions: value indices for organizational subunit transfer pricing, contemporary control systems, accounting frame work and cycle. Prerequisite: Acct 201 and 220. (Spring)

277 **Accounting and Decision Systems** (3) Pai

Accounting as a basis for economic decision-making by managemen and investors. Prerequisite: Acct 201 and 220. (Fall and spring)

282 **Accounting Information Systems** (3) Bodna

Development and application of accounting system theory, includin analysis, design, and implementation. Integration of automatic dat processing, accounting systems, and management information sy tems. Prerequisite: Acct 201 and 220. (Fall)

290 **Special Topics in Accounting** (3) Staf

Experimental offering; new course topics and teaching methods. Ma be repeated once for credit. (Fall or spring)

298 **Directed Readings and Research in Accounting** (3) Mastro and Staf

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as th demand requires. The courses are open to other graduate students at the discre tion of the department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3)

An analysis and critique of alternative theoretical frameworks fo describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, poten tials, and alternatives for structuring public and private institutions arrangements to meet the needs of society.

391 **Accounting Form and Substance—Doctoral Seminar** (arr.)

Discourse on current and major accounting issues. Presentation o papers by doctoral candidates and accounting faculty. Monthly, from start to end of doctoral program in accounting. (Fall and spring

398 **Advanced Reading and Research** (arr.) Mastro and Staf

Limited to students preparing for the Doctor of Business Administra tion or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Mastro and Staf

Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

See **English**.

AMERICAN STUDIES PROGRAM

Professors R.H. Walker, Jr., C.C. Mondale, B.M. Mergen *(Director)*
Professorial Lecturer L. Miller
Associate Professors J.O. Horton, H.F. Gillette, Jr., J.N. Pearce
Associate Professorial Lecturers C.R. Field, J. Mahoney, Jr., T.A. Comp, H.W. Marshall, J.K. Zilczer
Assistant Professors J.F. Santino *(Visiting)*, P.M. Palmer
Assistant Professorial Lecturers B.G. Carson, L.D. Lankton, S.J. Zeitlin, P.J. Cressey

Affiliated Programs

John Y. Cole (Library of Congress)
Atlee Schidler (Washington Center for Metropolitan Studies)
Wilcomb E. Washburn (Smithsonian Institution)

Faculty Advisory Committee

C.C. Mondale *(Chairman)*, S. Carroll, F.S. Grubar, R.L. Humphrey, J. Moreno, O. Seavey, R.P. Sharkey, R.W. Stephens, D.D. Wallace, Jr., A.M. Yezer

American Studies Council

The Council serves the American Studies Program in an advisory capacity. It includes representatives from the student body, the Washington community, the faculty, alumni, and affiliated programs.

Bachelor of Arts with a major in American Civilization (field-of-study)—The following requirements must be fulfilled:

1. The general requirements stated on pages 74, 81–87.
2. Prerequisite course—AmCv 71–72. (In preparation for the major field it is recommended that students take the introductory American history course and elect introductory courses in anthropology, art, economics, English, geography and regional science, philosophy, political science, religion, and sociology.)
3. Required courses in the major—(a) 15 semester hours of approved second-group courses in an American civilization core field, including U.S. social history (6 hours), American literature (6 hours), and an interdisciplinary elective (3 hours); (b) 15 semester hours of approved second-group courses in a related discipline or topical area; (c) AmCv 179–80, which must be taken in the senior year.

The major examination required of all seniors must be satisfactorily completed in the final year.

Special Honors will be awarded to students who fulfill the general requirements (see page 50) and in addition (1) receive grades of A in at least half of their courses in the two areas of concentration and (2) receive honors in the major examination.

Two years of a foreign language or adequate preparation in statistics, logic, or linguistics is strongly recommended. Students should consult frequently with an American Civilization advisor.

Master of Arts in the field of American Civilization—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in American Civilization or in the subject in which concentration is contemplated.

Required: the general requirements, pages 91–99, including (1) AmCv 271–72 (six semester hours), a seminar on scope and method in American Civilization; (2) 18 additional semester hours in a carefully related pattern, focusing on a concentrated approach to the study of American Civilization; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major emphasis falls; (4) a Master's Comprehensive Examination reflecting the candidate's area of concentration. Special options in the degree program include the following:

1. *A concentration in Museum Training*—Course emphasis on substantive research in material culture under direction of staff at the Smithsonian Institution. Required: in addition to the general requirements outlined above, AmCv 250. Recommended, but not required: AmCv 252 or 352 (advanced research), AmCv 251 (internship) and other related courses offered by the departments of anthropology, art, or education.

2. *A concentration in Historic Preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: background in urban history. Required: in addition to the general requirements outlined above, AmCv 277–78. Recommended, but not required: additional courses in architectural history, urban and regional planning, and local history.

Master of Arts in the field of Museum Studies, see pages 391–94.

Doctor of Philosophy in the field of American Civilization—This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and/or social sciences as they apply to the understanding of American civilization.

Required: the general requirements, pages 91–93, 99–101. Candidates must pass a General Examination in four areas within three calendar years of matriculation. American cultural history is the only required field. Three other fields may be elected with approval of the advisory committee; one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social, or urban history; American literature, art, philosophy, or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution (Museum of History and Technology, National Portrait Gallery and National Collection of Fine Arts)—supervised studies including architectural history, decorative arts, ethno-history, historical archeology, history of science, history of technology, industrial archeology, material aspects of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the Office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

First Group

71–72 **Introduction to American Civilization** (3-3) Gillette, Mergen
Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance. (Academic year)

Second Group

115 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

160-61-62 **Studies in American Literature** (3–3–3) Seavey, Romines, Sten
Same as Engl 160–61–62. Major factors in the national cultural tradition as shown by outstanding writers. (AmCv 160, 162—fall: 161—spring)

165 **Introduction to Folklore** (3) Santino, Zeitlin
History of folklore studies in Europe and America; terminology and study of different folk genres. Same as Anth 165.

170 **The Culture of Sport and Leisure in America** (3) Mergen
Sport, ritual, and play, and relationships between these activities and American society. A residential course, limited to 20 students who will live in Crawford Hall. (Fall)

173 **Afro-American History** (3) Horton
Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton
Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as Hist 174. (Spring)

177 **Introduction to Historic Preservation** (3) Pearce
Washington, D.C. will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. (Summer)

179–80 **Proseminar in American Civilization** (3–3) Mondale
Coordinating course for seniors majoring in American Civilization. (Academic year)

184 **Contemporary American Civilization** (3) Staff
Examination of the patterns of contemporary American life through study of literature and the arts, and political, social, cultural, and economic trends.

185 **History of Women in America** (3) DePau
Joint offering of the American Studies Program and the History De partment. Survey of the political, economic, social, military, religious intellectual, and cultural practices in North America from 1000 A.D to the present as these have affected and been affected by the femal half of the population. (Fall)

186 **U.S. Urban History** (3) Gillett
Joint offering of the American Studies Program and the History De partment. History of the American city from colonial foundations to the present, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from pre industrial to industrial to metropolitan forms, with attention to im plications for public policy and historic preservation. (Spring)

192 **The American Cinema** (3) Kernan
Joint offering of the American Studies Program and the Speech and Drama Department. History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to un derstand the role of films in the context of American culture. (Spring)

194 **Introduction to Historical Archeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history.

195 **Independent Study** (3) Staff
Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring)

197 **Oral History and Interview Techniques** (3) Gillette
Joint offering of the American Studies Program and the History De partment. Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. (Spring)

Third Group

215 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

225 **History of Washington, D.C.** (3) Gillette
The social history of Washington, from village to metropolis, with emphasis through field trips on the evolution of residential neigh borhoods and related issues of historic preservation and conservation. Same as Hist 225. (Summer)

260 **Women in the American Work Force** (3) Palmer
Joint offering of the American Studies Program and the Women's Studies Program. Multidisciplinary historical survey of women's work

roles and labor force participation, including social prescriptions for and self-perceptions of women, market and technological factors affecting women's work choices, psychological responses to work roles, and familial organization of work duties. Differential attitudes and experiences by class, race, and ethnic groups. (Fall)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Mondale
Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American Civilization. (Academic year)

274 **Research Seminar: Materials in Afro-American Culture** (3) Horton
Joint offering of the American Studies Program and the History Department. Prerequisite: AmCv/Hist 173 and 174 or equivalent. (Spring)

276 **U.S. Architectural History** (3) Pearce
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

277–78 **Historic Preservation** (3–3) Pearce
Joint offering of the American Studies Program and the History and Urban and Regional Planning Departments. The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. (Academic year)

289–90 **Seminar: Topics in American Civilization** (3–3) Staff
Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)

295 **Independent Study** (arr.) Staff
Limited to master's candidates. Permission of instructor, in writing, required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

351 **Vernacular Architecture** (3) Upton
Examination of selected regional and ethnic traditions in American building. Survey and field techniques, comparative study of related types of objects, and use of documentary sources. (Spring)

379–80 **Readings in American Cultural History** (3–3) Mergen
For students preparing for the Doctor of Philosophy general examination in the field of American Civilization. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff

Third Group

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Cole, Walker
Examination of the collections of the Library of Congress with the aim of increasing understanding of American culture and awareness of library-oriented research problems and possibilities. For students in the affiliated doctoral program, this course may lead directly to a field in "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Alternate academic years)

Fourth Group

355–56 **Practicum: Advanced Library Research** (3–3)
Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the Museum of History and Technology and at the National Portrait Gallery, by members of their staffs:

Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) — Washburn, Mergen

Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251 **Museum Research and Education** (3) — Washburn and Staff

Supervised work and/or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts, and photography as historical documentation. (Fall and spring)

252–53 **American Decorative Arts** (3–3) — Carson

Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made of wood, clay, glass, metal, and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

254 **Seminar: Folklore in America** (3) — Staff

Joint offering of the American Studies Program and the Anthropology Department. Various aspects of American traditional culture, including the theory and methodology of folklore research.

270 **Seminar: Museum Exhibiting** (3) — Mahoney

Joint offering of the American Studies Program and the Anthropology Department. Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. (Fall)

284 **Seminar: Studies in American Art and History** (3) — Miller

Joint offering of the American Studies Program and the Art Department. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit. (Fall and spring)

286 **Readings in the History of Technology in America** (3) — Comp

Seminar focusing on the major outlines of technological innovation in the United States. Beginning with Colonial and early Federal period technology transfer and adaptation, the course emphasizes the major sectors of 19th- and early 20th-century industrial and engineering development. (Fall)

287 **Introduction to Industrial Archeology and Material Culture** (3) — Lankton

Intensive study of tools, machines, and industrial architecture, focusing on the kinds of data they supply the historian. Students will be assigned objects to research. (Spring)

294 **Field Research in Historical Archeology** (3)

Joint offering of the American Studies Program and the Anthropology Department. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording photography,

preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis and spatial analysis. Specific research area and topics announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

Fourth Group

352 **Research in Selected Aspects of American Civilization** (3)

Supervised study and/or field work in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)

For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under curatorial supervision at the Smithsonian Institution. Prerequisite: AmCv 351–52. May be repeated for credit. (Fall and spring)

ANATOMY—DOCTORAL PROGRAM

Professors F.D. Allan, T.N. Johnson, R.S. Snell *(Chairman)*, E.N. Albert, M.J. Koering
Associate Professor K.E. Johnson
Assistant Professors J. Kerns, F.J. Slaby, R.J. Walsh

Doctor of Philosophy in the field of Anatomy—Required: The general requirements, pages 91–93, 99–101. Candidates must also fulfill tool requirements by demonstrating proficiency in two of the following: a language (German, French, or Russian), biostatistics, computer science, or biological instrumentation. There will also be a comprehensive written and oral examination that will cover at least three areas of anatomical studies.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Faculty approval is required for all courses.

Third Group

202 **Gross Anatomy** (6) Snell and Staff

Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Embryology** (1) Staff

Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson

Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13.

205 **Human Microscopic Anatomy** (3) Albert and Staff

Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) Koering
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology (3)** (Same as Phyl 212) Staff
An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221–22 **Seminar** (1–1) Gilson*
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Staff
Variations in humans and factors affecting them; human evolution and racial differences; anatomy and culture of ancient humans. (Spring)

253 **Brain-Tissue Interactions** (1) Kerns and Walsh
Interactions of the CNS with the muscular, sensory, and endocrine systems. Student presentations and clinical aspects. Prerequisite: Idis 212. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. Limited enrollment. Laboratory fee, $10. (Spring)

256 **Teratology** (1) Gilson*
Introduction to teratologic principles and techniques, with emphasis on experimental design. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Transmission Electron Microscopy** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Spring)

* Barbara Ellen Gilson is Assistant Professor of Anatomy at the G.W.U. School of Medicine and Health Sciences.

262 **Gross Anatomy of Upper and Lower Extremities** (2) — Snell and Staff

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) — Snell and Staff

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) — Snell and Staff

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) — Snell and Staff

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

270 **Dissection of the Human Brain** (1) — T. Johnson

Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

272 **Autonomic Nervous System** (1) — Allan

Development, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system, with clinical consideration. (Spring)

275 **Advanced Human Embryology** (1) — Allan

Microscopic examination of the human embryo at several critical periods during embryogenesis. Limited enrollment. (Spring)

276 **Advanced Studies in Anatomy** (1) — Staff

Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

288 **Surface Anatomy and Radiology** (1) — Snell

Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) — Slaby

The application of biochemical and electron micrographic techniques used in cell biology research. Limited enrollment.

295 **Research** (arr.) — Staff

Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) — Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANTHROPOLOGY

Professors R.K. Lewis, R.M. Krulfeld, R.L. Humphrey, Jr.
Professorial Lecturer J.L. Angel
Associate Professors V.K. Golla *(Chairman)*, S.L. Simons, A.S. Brooks
Associate Professorial Lecturers J. Mahoney, Jr., S. Hertz, M. Koch-Weser, G. Teleki, Jr., D. Von Endt
Assistant Professors R.K. Evans *(Visiting)*, C.A. Wagner, J.F. Santino *(Visiting)*
Adjunct Assistant Professor C.R. Rose
Assistant Professorial Lecturers R.O. Selig, P.J. Cressey, K.M. Calavan, S.G. Frayser
Instructor J. Lanouette
Lecturer A.G. Webster

Bachelor of Arts with a major in anthropology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite course—Anth 1–2.
3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) six to twelve semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.
4. Requirements for the major—24 to 36 semester hours in second-group anthropology courses, including Anth 101 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s), linguistics (161, 168, or 169), ethnology (courses numbered in the 170s), and physical anthropology or archeology (courses numbered in the 180s). Students intending to pursue a graduate degree in anthropology should take Anth 157 and at least one course each in archeology and physical anthropology. Qualified seniors may enroll in 200-level courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archeological field school credit may be accepted and applied toward the major, if approved by the department, and majors are encouraged to participate in such summer programs. Opportunities sometimes also exist for field and laboratory research during the academic year, both within the department and elsewhere in the Washington area. Credit for such work (not to exceed 6 semester hours) may be granted through registration in Anth 195. Seniors in anthropology are urged to enroll in Anth 198, *Senior Seminar*; candidates for graduation with Special Honors must register in Anth 198 or for 3 semester hours of Anth 195, *Undergraduate Research*, and write a paper of special distinction arising out of a program of directed reading or research.

Bachelor of Arts with a major in classical archeology and anthropology (departmental)—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Required courses in other areas: six semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field-work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Minor in general anthropology—21 credit hours are required, including Anth 1–2, 101, and four additional semester courses in anthropology, no more than two of which may be taken in the same subdiscipline. (For the purposes of this minor the department's second-group courses may be divided into subdisciplines as follows: biological anthropology—Anth 186, 187, and 188; archeology—Anth 180, 182, 183, 184, 185, 190, and 194; anthropological linguistics—Anth 161, 168, and 169; socio-cultural anthropology—all other second-group courses, with the exception of Anth 195, 196, and 198, in which the topic is variable.)

Minor in archeology—18 credit hours are required, including Anth 1 and 180; three courses chosen from Anth 182, 183, 184, 185, 190, and 194; an approved field or research course or a fourth course chosen from the preceding list.

Minor in biological anthropology—15 to 18 credit hours are required, including Anth 1, 186, 187, and 188; an approved field or research course or an approved course or course sequence in a related field (including biological sciences, geology, psychology, statistics, and certain other disciplines).

Minor in socio-cultural anthropology—18 credit hours are required, including Anth 2 and 101; one course in ethnography (Anth 170–179); Anth 151 or 152; Anth 156 or 157; one course chosen from Anth 150, 153, 155, 158, or 159.

Minor in cross-cultural communication—18 credit hours are required, including Anth 2, 161, 163; Anth 150 or 159; one course in ethnography (Anth 170–179); one course chosen from Anth 153, 155, 158, or 165. Psyc 115 is recommended.

Master of Arts in the field of anthropology—Prerequisite: a bachelor's degree; a major in anthropology is preferred. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archeology, and physical anthropology. Students with less background in anthropology may be admitted, but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. *General degree*—Required: the general requirements, pages 91–99. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first

24 semester hours of graduate course work. A reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A tool course in statistics, computer programming, or a similar technical field may be substituted for the foreign language reading examination, if approved by the department. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. *With a concentration in museum training*—Required: the general requirements, pages 91–99. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work, and must include from 12 to 15 semester hours of work in museum-related courses, at least 6 semester hours of which must be in an internship. In addition to the tool options described above, museum training students may substitute for the foreign language reading examination an appropriate course in chemistry or photography, if approved by the department. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropology, are advised to apply to the Masters program in Museum Studies (pages 391–94).

Course accessibility: Anth 152, 161, 165, 168, 169, and 180 may be taken without anthropology course prerequisites: Anth 1 is prerequisite to Anth 186, 187, and 188; Anth 1 or 180 is prerequisite to Anth 182, 183–84, and 185; Anth 1 and 2 are prerequisite to Anth 101; Anth 2 or the permission of the instructor is required for all other second-group courses.

First Group

1–2 **Introductory Anthropology** (3–3) Staff

Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior. (Anth 1 and 2—fall and spring)

Second Group

101 **Survey of Anthropological Theory** (3) Wagner, Krulfeld, Golla

The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. (Fall)

115 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen

Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

150 **Comparative Value Systems** (3) Krulfeld

World views, conceptual systems, and value orientations of representative cultures throughout the world.

151 **Primitive Economics** (3) Krulfeld

Comparative study of various economic organizations, including hunters and gatherers, herders, and cultivators. (Spring, odd years)

152 **Man, Culture, and Environment** (3) Humphr
Basic principles of cultural ecology. Human interaction with ecosystem both past and present; emphasis on the application anthropological precepts to current environmental proble

153 **Psychological Anthropology** (3) Simo
Relevance of psychological theories to human evolution and cross-cultural study of personality. Cultural determinants of pe sonality formation and mental health. (Spring)

155 **Anthropological Approaches to Religion** (3) Simons, Wagn
Joint offering of the Anthropology and Religion Departments. Theori of religion developed by anthropologists; survey of world religio with emphasis on preliterate societies; religious processes a change. (Spring)

156 **Comparative Political and Legal Systems** (3) Hertz, Simon
Cross-cultural study of ancient and modern systems of social con trol; moral, ethical, and legal factors which operate to produce be havioral norms. (Spring)

157 **Primitive Social Organization** (3) Simons, Hert
Analysis of the social organization of primitive peoples; kinship economic, and political systems. (Fall)

158 **Art and Culture** (3) Krulfeld, Humphrey, Wagne
The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production. (Fall)

159 **Cognitive Anthropology** (3) Wagner, Golla
The organization of empirical knowledge in literate and nonliterate societies. Processes of hypothesis, deduction, and classification. (Fall, odd years)

161 **Language and Culture** (3) Golla
Structure and semantics of systems of human communication; linguistic change; social aspects of language. (Fall)

163 **Anthropology of Visual Communication** (3) Staff
Still and motion picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Material fee, $15.

165 **Introduction to Folklore** (3) Santino, Zeitlin
History of folklore studies in Europe and America; terminology and study of different folk genres. Same as AmCv 165.

168 **Methods of Linguistic Analysis** (3) Golla
Phonetics, grammatical analysis, principles of lexicography, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall)

169 **Intensive Study of a Language** (3) Golla
Analytic study of a selected language, ordinarily one not frequently studied in a university context, as an illustration of the methods of

anthropological linguistics. Prerequisite: Anth 168. (Spring or summer)

170 **Cultures of the Caribbean** (3) Lewis
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. (Spring, even years)

171 **Native Peoples of North America** (3) Simons, Humphrey
Comparative study of Indian groups representative of each of the continent's culture areas. (Fall)

172 **Cultures of South America** (3) Wagner
Survey of native American, Iberian, and African populations of South America, and their interactions. (Fall)

173 **Cultures of the Pacific** (3) Lewis
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. (Fall, even years)

175 **Topics in Asian and Circumpolar Ethnography** (3) Humphrey, Krulfeld, and Staff
Intensive, integrated study of a selected culture area in or around Asia (including Circumpolar regions). Specific area to be announced in the *Schedule of Classes*. May be repeated for credit.

177 **Cultures of the Near East** (3) Lewis
Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East; emphasis on the Arab world. (Spring, odd years)

178 **Cultures of Africa** (3) Lewis, Hertz
Comparative examination of the history, cultural development, and contemporary problems of African cultures. (Fall, odd years)

180 **General Archeology** (3) Humphrey, Brooks, Evans
Field and laboratory methodology in archeology: stratigraphy, dating techniques, chronological systems and their implications; a brief survey of world prehistory.

182 **New World Archeology** (3) Humphrey
Introduction to archeological methodology, theory, and survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. (Spring)

183–84 **Old World Prehistory** (3–3) Brooks, Evans
Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. (Academic year)

185 **Latin American Archeology** (3) Humphrey, Wagner
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Meso-America in odd years. May be repeated for credit. (Spring)

186 **Physical Anthropology of Modern Man** (3) Ang
Individual and social biology, methods, and techniques. Genetic, cu tural, and ecologic backgrounds of individual and population vari tion: micro-evolution, growth, paleodemography, paleopatholog forensic identification, techniques. (Spring)

187 **Introduction to Hominid Evolution** (3) Brook
The fossil record of hominid evolution considered in the light o evolutionary theory. Brief review of the earlier human antecedents with concentration on the Pleistocene remains. (Spring, odd years

188 **Primatology** (3) Brooks, Telek
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Fre quent meetings at the National Zoological Park. (Fall)

190 **Ethnohistory** (3) Wagner, Humphrey
Joint offering of the Anthropology and History Departments. Recon struction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archeological re mains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*.

194 **Introduction to Historical Archeology** (3) Cressey
Joint offering of the American Studies Program and the Anthropology Department. Survey of the basic data and methods of research in the material culture of recent history. (Spring)

195 **Undergraduate Research** (arr.) Staff
Individual research problems to be arranged with a member of the faculty. May be repeated for credit.

196 **Special Topics in Anthropology** (3) Staff
Courses offered by visiting faculty; experimental offerings. Topic to be announced in the *Schedule of Classes*. May be repeated for credit

198 **Senior Seminar** (3)
Study and discussion of selected major works in anthropology. Pre requisite: Anth 101 and senior standing in anthropology.

200 **Methods in Socio-Cultural Anthropology** (3) Krulfeld
Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. (Spring)

Third Group

201 **Proseminar: Biological Anthropology** (3) Brooks
Theories, methods and current issues in the various subdisciplines of biological anthropology. (Spring)

202 **Proseminar: Socio-Cultural Anthropology** Krulfeld, Simons
Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)

203 **Proseminar: Anthropological Linguistics** (3) Golla

Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)

204 **Proseminar: Method and Theory in Archeology** (3) Humphrey, Brooks

Survey of the most recent archeological techniques and theoretical approaches to reconstructing and interpreting the cultures of the past. (Fall)

211 **Seminar: Problems in Conservation** (3) Rose

Joint offering of the Anthropology and Art Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Von Endt

Joint offering of the Anthropology and Art Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of instructor. (Fall)

215 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen

Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

254 **Seminar: Folklore in America** (3) Mergen

Joint offering of the Anthropology Department and the American Studies Program. Various aspects of American traditional culture, including the theory and methodology of folklore research.

255–56 **Anthropology for Teachers** (4–4) Lanouette and Saff

Examination of current research, innovative classroom techniques and materials. Sessions with anthropologists at museums, laboratories, and zoos. Designed for middle and secondary school social science and science teachers. May not be taken for credit by M.A. candidates in anthropology.

258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Wagner, Krulfeld

Anthropological approaches to aesthetic problems in the context of ethnographic materials.

260 **Seminar: Culture Theory** (3) Krulfeld, Wagner

Contemporary theories of culture.

262 **Seminar: Applied Anthropology** (3) Lewis

Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

264 **Seminar: Anthropological Museum Techniques** (3) Humphrey
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research and instructional use of the museum. Field trips to area museums. (Fall)

266 **Seminar: Technology** (3) Humphrey, Lewis
Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Krulfeld
Comparative study of systems of production, distribution, and consumption. (Fall)

268 **Seminar: Peasant Society** (3) Krulfeld
Cross-cultural analysis of peasant societies, including their manner of functioning within their larger social, economic, and cultural context. (Fall)

269 **Seminar: Structural Problems** (3) Simons
Comparative survey of principles of descent, kinship terminology, and formation of descent groups; problems of variation and change in kinship systems and development of kinship models. (Spring)

270 **Seminar: Museum Exhibiting** (3) Mahoney
Joint offering of the Anthropology Department and the American Studies Program. Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. Taught at the Smithsonian Institution. (Fall)

272 **Seminar: Topics in Latin American Anthropology** (3) Wagner, Koch-Weser
Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archeological problems.

273 **Seminar: Urban Anthropology** (3) Hertz
Anthropological investigations of city life from Neolithic beginning to the present. Study of occupational, class, and ethnic communities within cities as well as ethnographies of entire cities. Adaptation of traditional field methods to urban settings. (Spring)

274 **Seminar: Topics in American Culture** (3) Hertz
Specific topic or topics to be announced in the *Schedule of Classes*. (Fall)

282 **Seminar: Advanced Archeology—New World Prehistory** (3) Humphrey, Stuart
Current archeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archeology** (3) Brooks
Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes.* (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of his or her chosen discipline; each student writes a report on some aspects of a selected key theme. Admission by permission of instructor. (Spring)

290 **Advanced Museum Research** (3) Staff
Supervised individual research and/or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Anthropology in the Museum** (3) Evans
(Formerly Seminar: Museology)
Anthropological materials (in the broadest sense), exhibits, and museums. Topics include: museum anthropology, collections, research, interpretation, and education, with a focus on the practical problems of developing an anthropological exhibit hall. (Spring)

292 **Introduction to Conservation** (3) Rose
Joint offering of the Anthropology and Art Departments. Method and theory of conservation, including fine arts, ethnographic archeological and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall class is only open to conservation students and those who will be registered for Anth 293 in the spring. The summer course deals with conservation of archeological materials. (Fall, spring, and summer)

293 **Conservation Laboratory Techniques** (3) Rose
Joint offering of the Anthropology and Art Departments. Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Prerequisite: Anth 292, Chem 13 or equivalent. Taught at the Smithsonian Conservation Laboratory. Admission by permission of instructor. (Spring)

294 **Field and Laboratory Research in Archeology** (3) Staff
Joint offering of the Anthropology Department and the American Studies Program. Field and/or laboratory techniques and interpretation. Topics may include excavation methods, recording, photography, preservation, stratigraphy and environmental reconstruction, typology, use-wear analysis, and spatial analysis. Specific research area and topics announced in the *Schedule of Classes.* May be repeated for credit. (Fall and spring)

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ART

Professors L.P. Leite *(Emeritus)*, F.S. Grubar, D.H. Teller, L.F. Robins *(Chairman)*
Professorial Lecturers Grace Evans, D.A. Brown, L. Miller
Associate Professors H.I. Gates, J.L. Lake, J.F. Wright, Jr., A.H. Smit T. Ozdogan
Adjunct Associate Professor Grose Evans
Associate Professorial Lecturers B.S. Glassman, A.D. Ullberg
Assistant Professors W.T. Woodward, F. Griffith, J.C. Anderson, D.M Hitchcock, C.C. Costigan, B. Von Barghahn, S.B. Molina, M.P. Lade E.R. Williams
Adjunct Assistant Professor C.R. Rose
Assistant Professorial Lecturers E.L. Battaglia, E.P. Lawson, B.D. Lourie H.H. Hudgins, Jr., A. Seremetis, K. Montgomery, J. Morrell, Jr., L. Smith A.B. Barnhart, A.L. Glassman, C. Smigrod, G. Wartofsky, B.G. Carson J.P. Ansell
Lecturer J.G. Kauffman
Curator, Dimock Gallery L.D. Miller

Bachelor of Arts with a major in art history (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. Prerequisite courses—Art 31–32 or 71–72.
3. Required courses in related areas—Art 137; Fren 1–2, 3–4, or Ger 1–2, 3–4; Phil 162; or equivalent.
4. Required courses in the major—Art 101 or 102, 104 or 105, 106 or 107, 108, 109, 110, 112, 113 or 114, 117 or 118 or 119; nine additional semester hours in second-group art history courses.
5. A maximum of nine semester hours in Fine Arts, including Art 137, is permitted.

Graduation with Special Honors: students should apply to the chairman of the department at the beginning of their senior year. Before admittance to the program, they must pass a reading examination in either French or German. Upon acceptance, candidates will be assigned to one or more faculty advisors under whose direction they will undertake a supervised program of study.

Bachelor of Arts with a major in Fine Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. Prerequisite courses—Art 21–22, 41–42 (students concentrating in photography substitute Art 23–24 for 41–42).
3. Required courses in related areas—Art 31–32; six additional semester hours in second-group art history courses.
4. Required courses in the major—27 semester hours of first- or second-group Fine Arts courses in eight areas—ceramics, advanced design, advanced drawing, graphics, painting, photography, sculpture, and visual communication. Students choose one of these areas as a primary area of concentration, in which 12 semester hours are required. The remaining 15 semester hours must be distributed among any three other areas. (Transfer students must take at least 12 semester hours of second-group Fine Arts courses in residence at this University.)

Fine Arts seniors may apply for graduation with Special Honors. To be accepted into this program, students must satisfy the general requirements (see page 50). They should apply in writing to the chairman of the Art Department at the beginning of their senior year. Upon acceptance, each candidate will be assigned one or more faculty advisors under whose direction a project in a special area of interest will be undertaken.

Bachelor of Arts with a major in classical archeology and anthropology (departmental)—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to satisfy requirements.

2. Required courses in other areas: six semester hours, or equivalent, of introductory French, German, Latin, Greek, or a Near Eastern language. A second year of language study is strongly encouraged. Since graduate study in archeology usually involves broader preparation, especially in languages, students intending to pursue graduate study should consult with the departmental advisor as early as possible in their undergraduate programs.

3. Required courses in the major: Anth 180, 183, 184, and one course chosen from Anth 152, 158, 177, or an approved 3-hour course in field-work; four courses chosen from Art 101, 102, 103, 112, 155; two courses chosen from Clas 71, 72, 108, 113, 170; two courses chosen from Hist 107, 108, 109, 110 (students electing Hist 108 should previously have completed Hist 107 or 109).

Bachelor of Arts with a major in classical archeology and classics (departmental)—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. Students should consult their departmental advisor regarding courses to be taken to satisfy the requirements.

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 14 semester hours of second-group courses in Greek or Latin, including Clas 138. (A reading knowledge of French and German is recommended.)

Master of Arts in the field of art history—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archeology, medieval art, Renaissance and Baroque art, contemporary art, and American art*—Required: the general requirements, pages 91–99; 36 hours of course work including six semester hours of thesis research. As many as possible of the 36 semester hours of course work should be in third-group courses; not more than six hours may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the six semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.

2. *With a concentration in museum training*—Required: the general requirements, pages 91–99; 42 semester hours of course work as follows: 12 hours of art history courses, taken before acceptance into the museum program: Art 201–2 and 271–72, and 18 additional hours of art history courses selected in consultation with the advisor, not more than six hours to be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. Students are re-

quired to pass the general written Master's Comprehensive Examination in Art History and may also be required to pass a written comprehensive examination in Museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Collection of Fine Arts, the Phillips Collection, the Renwick Gallery and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

Master of Arts in the field of classical archeology, classics, and history (an interdepartmental degree program offered by the Departments of Art, Classics, and History)—Prerequisite: A bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99, and 30 semester hours of course work, including six semester hours of thesis research (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the Departments of Art, Classics, and History. Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

Master of Fine Arts in the field of ceramics, design, graphics, painting, photography, sculpture, or visual communication—Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in Fine Arts in the field of ceramics, design, drawing, graphics, painting, photography, sculpture or visual communication. A 3.00 undergraduate grade-point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slides of at least 10 drawings, including figure studies, and four to six paintings, prints, sculptures, ceramics, or photographs. Students planning to do graduate work in graphics or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements, pages 91–99. As a tool requirement Master of Fine Arts candidates must take Art 137 or three additional hours of course work selected in consultation with the advisor. As many as possible of the remaining 24 hours of course work should be in third-group courses, only 18 hours of which may be in one area; the remaining six hours are to be selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, graphics, painting, photography, or sculpture will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader. For details, consult the chairman of the department.

Doctor of Philosophy in the field of art history—Required: the general requirements, pages 91–93, 99–101, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German, a General Examination in art history, an examination in the area of specialization,

and examinations in two areas related to the area of specialization. Students plan their own programs in consultation with a departmental committee.

Areas of Specialization: classical art and archeology, Medieval art, Renaissance art, Baroque art, eighteenth-century art, nineteenth-century art, twentieth-century art, and American art.

Bachelor of Arts in Education and Human Development with a teaching field in art—Prerequisite: the education curriculum, page 114.
Required: the art option and professional courses listed on page 117.

ART HISTORY

First Group

1 **Introduction to Art** (3) — Von Barghahn and Staff
General principles, theories, and techniques. (Fall, spring, and summer)

31–32 **Survey of Western Art** (3–3) — Robinson and Staff
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art. (Art 31 and 32—fall and spring)

71–72 **Introduction to the Arts in America** (3–3) — Grubar and Staff
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

Second Group

101 **Greek Art and Archeology** (3) — Williams
(Formerly Greek and Roman Architecture)
(Fall)

102 **Roman Art and Archeology** (3) — Williams
(Formerly Greek and Roman Sculpture)
(Spring)

103 **The Ancient Artist and His Workshop** (3) — Williams
(Formerly Classical Iconography)
Origin and development of myths in classical art.

104 **Renaissance Art in Italy I** (3) — Grace Evans
Early developments from the 13th to the 15th century. (Fall)

105 **Renaissance Art in Italy II** (3) — Grace Evans
High Renaissance and Mannerism. (Spring)

106 **Renaissance Art in the North I** (3) — Hitchcock
Northern painting from van Eyck through the Antwerp Mannerists. (Fall)

107 **Renaissance Art in the North II** (3) — Hitchcock
Northern painting and graphics from Dürer through Brueghel. (Spring)

108 **18th-Century Art in Europe** (3) — Hitchcock
(Spring)

109 19th-Century Art in Europe (3) Robinso
(Fall and spring)

110 Contemporary Art (3) Lade
(Fall and spring)

111 Classical Archeology (3) William
Archeological monuments of classical civilizations, with intensiv study of one or more areas selected from architecture, sculpture painting, or minor arts.

112 Egypt and the Ancient Civilizations (3) William
Study of the art of Mesopotamia, Anatolia, Egypt, and Persia (Spring)

113 Baroque Art in Italy (3) Grose Evans
(Spring)

114 Baroque Art in the North (3) Hitchcock
Holland, Flanders, Spain, France, Germany, and England. (Fall)

115 Christian Iconography (3) Anderson
Origins and development of Christian symbols and themes from early Christian to modern times.

116 Islamic Art (3) Staff

117 Medieval Art I (3) Anderson
Early Christian and Byzantine. (Fall)

118 Medieval Art II (3) Anderson
Romanesque and Gothic. (Spring)

119 Pre-Romanesque Art in the North (3) Anderson
Merovingian and Carolingian. (Spring)

120 Art of China and Japan (3) Von Barghahn
(Fall)

121 Spanish Painting I: The Catalan Frescoes through El Greco Von Barghahn

122 Spanish Painting II: Ribera through Goya Von Barghahn

129–30 Principles of Museum Work (3–3) Lawson
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service. (Academic year)

140 Gothic Architecture (3) Staff

145 Folk Arts in America (3) Grubar
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

147 Pre-Columbian Art (3) Von Barghahn

148 19th-Century American Painting (3) Grubar, Grose Evans
(Fall)

149 **19th-Century American Sculpture** (3) Grubar
(Spring)

150 **Landmarks in American Art** (3) Grubar

155 **The Aegean Civilizations** (3) Williams

156 **Early Medieval Sculpture** (3) Evans

161 **Studies in Renaissance Art** Grace Evans
(Formerly Monuments of Christian Rome)

162 **The Art of Oriental Rugs** (3) Staff

165 **African Art** (3) Von Barghahn

167 **French Painting: 15th and 16th Centuries** (3) Von Barghahn

169–70 **History of Decorative Arts** (3–3) Carson
(Academic year)

173 **History of the Cinema** (3) Kernan
Joint offering of the Art and Speech and Drama Departments. An examination of motion picture history in terms of socially structured narrative from Griffith to Godard. (Spring)

Third Group

201–2 **Museum Projects** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the field of museum training.

203 **Primitive Art** (3) Staff
(Spring)

207 **Modern Architecture** (3) Lader
Europe and America. (Fall)

211 **Seminar: Problems in Conservation** (3) Rose
Joint offering of the Art and Anthropology Departments. Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

212 **Advanced Conservation Techniques** (3) Staff
Joint offering of the Art and Anthropology Departments. Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)

213 **Museum Administration and Government** (3) Staff

214 **Museum Administration and Trusteeship** (3) Staff

216 **Medieval Painting** (3) Grace Evans
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) Ullberg

*220 **Seminar: Baroque Art of the 17th Century** (3) Hitchcock
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

*221 **Seminar: Renaissance Art** (3) Staff
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

*†243 **Seminar: American Art** (3) Grubar
(Fall and spring)

*†244 **Seminar: 19th-Century European Art** (3) Robinson
Reading knowledge of French desirable.

*†245 **Seminar: 20th-Century European Art** (3) Lader

*246 **Seminar: Classical Art** (3) Williams

*247 **Seminar: Medieval Art** (3) Anderson

248 **Independent Research in Art History** (3)
(Fall and spring)

261 **Seminar: Problems in Art History** (3) Staff
Recommended for art history majors; open to limited number of qualified undergraduates, with permission of instructor. Theory, criticism, or methodology of art history. May be repeated for credit. Topic to be announced in *Schedule of Classes*. (Fall and spring)

271–72 **Museum Techniques** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

284 **Seminar: Studies in American Art and History** (3) Staff
Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution. Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3) Staff
(Fall and spring)

292 **Introduction to Conservation** (3) Rose
Interdepartmental course offered by the Art and Anthropology Departments. Method and theory of conservation, including fine arts, ethnographic, archeological, and monuments conservation; handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to

* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the specific area covered is different.
† Laboratory fee, $15 when course is taught off campus.

their environment. The fall section is open to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

293 **Conservation Laboratory Techniques** (3) Rose

Interdepartmental course offered by the Art and Anthropology Departments. Discussion (2 hours), laboratory (6 hours). Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Taught at the Smithsonian Conservation Laboratory. Prerequisite: Art or Anth 292, Chem 13. (Spring)

Fourth Group

Limited to art history doctoral candidates. Offered as the demand requires.

*385–86 **Readings in Art History** (3–3)

*398 **Advanced Reading and Research** (arr.)

For students preparing for the doctoral examination.

*399 **Dissertation Research** (arr.)

FINE ARTS

Departmental prerequisite: Art 21–22 and 41–42 (students concentrating in photography substitute Art 23–24 for 41–42).

First Group

21–22 **Design I: Basic** (3–3) Costigan, Teller

Required of all Fine Arts majors. Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, $15. Art 22: Laboratory fee, $21. (Art 21 and 22—fall and spring)

23 **Introduction to Photography** (3) Lake and Staff

Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, $36. (Academic year)

24 **Fundamentals of Photography** (3) Lake and Staff

Film developers; types and effects on films. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, $36. (Academic year)

41–42 **Drawing I** (3–3) Wright and Staff

Elementary investigation of concepts of drawing, both traditional and contemporary; training in perception, analysis of form in light and space; instruction in the use of graphic materials and media; exercises in connoisseurship. Material fee, $24 per semester. (Art 41 and 42—fall and spring)

*May be repeated for credit.

51–52 Ceramics I (3–3) Smith

Working with clay as an art form. Basic techniques of handbuilding, kiln-firing, clay and glaze making. Laboratory fee, $54 per semester. (Academic year)

57–58 Graphics I (3–3) Griffith, Wright

Exploration of the methods of intaglio, relief, printing, and other composite processes. Material fee, $21 per semester. (Academic year)

61–62 Water Color (3–3) Staff

Painting in transparent and opaque water color and in acrylic. Experimentation, figurative and landscape. (Academic year)

65–66 Painting I (3–3) Smith and Staff

Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Prerequisites: Art 21, 41. Material fee, $15 per semester. (Academic year)

81–82 Sculpture I (3–3) Gates and Staff

Three-dimensional design. Basic sculptural techniques; modeling, carving, and construction. Media include wood, clay, stone, plaster. Laboratory fee, $24 per semester. (Academic year)

Second Group

Second-group art courses may be repeated for credit with approval of department.

123–24 Individual Problems (3–3) Staff

Emphasis on problems and materials of specific interest to the student in any area of Fine Arts. Laboratory fee depending on area chosen.* Prerequisite permission of instructor. (Academic year)

125–26 Painting II (3–3) Smith

Alteration of personal expression and structured problems dealing with still-life and the figure. Use of acrylic and oil. Material fee, $15 per semester. (Academic year)

127–28 Painting III (3–3) Woodward

Studies in the interpretation of the figure and still-life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material fee, $15 per semester. (Academic year)

131–32 Ceramics II (3–3) Ozdogan

Continuation of basic ceramic building techniques and laboratory activities. Introduction to wheel-throwing, clay and glaze test studies. Laboratory fee, $54 per semester. (Academic year)

133 Ceramic Decoration (3) Ozdogan

Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, mishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee, $54. (Fall)

* *Schedule of Fees:* Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$24; Graphics—$21; Sculpture—$24; Typography—$30; Painting—none; Photography—$36; Visual Communication—[illegible].



134 **History of Photography** (3) Staff
(Spring)

135–36 **Advanced Water Color** (3–3)
Development of techniques of water color; concentration on special projects. (Academic year)

137 **Workshop in Materials, Methods, and Techniques** (3) Woodward, Smith, and Staff
Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $15. (Fall and spring)

138 **Graphics: History and Practice** (3) Griffith
Laboratory fee, $21.

139 **Design in Fiber** (3) Costigan
Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Prerequisite: Art 21–22 or permission of instructor. Laboratory fee, $9.

141 **Interior Design** (3) Teller and Staff

142 **House Planning** (3) Staff

143–44 **Serigraphy** (3–3) Teller
Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Prerequisite: Art 21 and 41–42. Laboratory fee, $21 per semester. (Academic year)

146 **Ceramic Restoration** (3) Ozdogan
All methods and techniques. Student projects include surface and structural repairs with laboratory tests and activities. Laboratory fee, $21. (Summer)

151–52 **Ceramics III** (3–3) Ozdogan
Developing quality and creativity with emphasis on achieving high standards of craftsmanship in hand-building and wheel-throwing. Laboratory tests and activities. Laboratory fee, $54 per semester. (Academic year)

153–54 **Graphics II** (3–3) Griffith, Wright
Advanced relief, intaglio, and other composite processes. Prerequisite: Art 57–58. Material fee, $21 per semester. (Academic year)

157–58 **Graphics III** (3–3) Griffith
Exploration of combined techniques and mixed media. Prerequisite: Art 153–54. Material fee, $21 per semester. (Academic year)

159–60 **Drawing II** (3–3) Wright and Staff
Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Prerequisite: Art 41–42. Material fee, $24 per semester. (Academic year)

163–64 Visual Communication I (3–3) Molina and Staff

Layouts and execution in client-presentation form of various graphic design projects—brochures, bookjackets, displays, title graphics for film media. Material fee, $21 per semester. (Academic year)

166 Advanced Drawing Techniques (3) Smith and Staff

Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different. Prerequisite: Art 41–42. Laboratory fee, $21.

171 Typography I (3) Molina and Staff

Techniques of hand lettering, traditional and contemporary. Exploration of the decorative potential in lettering. Material fee, $21. (Fall)

172 Typography II (3) Molina

Study of type classification, recognition, and adaption. Methods of copy fitting and type reproduction processes. Typographic layout and specification. Material fee, $21. (Spring)

174 Visual Communication II (3) Molina

Limited to seniors. Material fee, $21.

175 Lithography (3) Staff

May be repeated for credit if the area covered is different. Material fee, $21.

177–78 Survey of Printing and Illustration (3–3) Staff

Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)

179–80 Sculpture II (3–3) Gates

Creation of three-dimensional forms using combination of techniques: wood, steel, plastic, and plaster. Prerequisite: Art 81–82. Laboratory fee, $24 per semester. (Academic year)

181 Introduction to Color Photography (3) Lake

Use of filters for creating and correcting color shifts with emphasis on color as subject matter. Prerequisite: Art 23–24 or permission of instuctor. Laboatory fee, $36. (Fall)

182 Intermediate Photography (3) Lake

Filters and their use with black-and-white film as means of tone control. Emphasis on creative expression. Prerequisite: Art 23–24 or permission of instructor. Laboratory fee, $36. (Spring)

183 Intermediate Black and White Photography (3)

Emphasis on role of ideas in black and white photography. Critiques designed to encourage development of an individual style. Prerequisite: Art 23–24 or permission of instructor. Laboratory fee, $30. (Fall and spring)

185–86 Painting and Drawing (3–3)

Techniques of drawing and painting in oil, acrylic, and water color. Work from life model and still life. Material fee, $15 per semester.

189–90 **Sculpture III** (3–3) Gates

Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179–80. Laboratory fee, $24 per semester. (Academic year)

193–94 **Film Making** (3–3)

Basic techniques and procedures in film making. Each student will create a short film. Art 193 is prerequisite to Art 194. (Academic year)

195 **Documentary Photography** (3) Battaglia

Joint offering of the Art and Journalism Departments. Historical development of documentary photography. Completion of two projects required. Laboratory fee, $36. Prerequisite: Art 23–24 or permission of instructor. (Fall)

197–98 **History of Photography** (3–3)

Discussion of major figures and movements in the history of photography.

Third Group

All third-group art courses may be repeated for credit with the approval of the department.

205 **Advanced Photography: Zone System Tests** (3) Lake

Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181–82 or permission of instructor. Laboratory fee, $36 per semester. (Fall and spring)

206 **Photography: Special Projects** (3) Lake and Staff

Prerequisite: Art 23–24, 181–82, or permission of instructor. Laboratory fee, $36. May be repeated for credit.

208 **Advanced Photography** (3)

Advanced problems in photography; emphasis on individual development. Prerequisite: Art 181–82 or permission of instructor. Laboratory fee, $30. (Fall and spring)

209–10 **Exhibition and Display Design** (3–3) Miller

224 **Ceramic Sculpture** (3) Ozdogan

Principles of sculptural design in clay. Bibelot, garden ceramics, and figurative forms. Laboratory fee, $54. (Fall)

225 **Advanced Ceramic Decoration** (3) Ozdogan

Specially designed projects in relief, intaglio, engobe, underglaze, majolica, and overglaze. Laboratory fee, $54.

226 **Architectural Ceramics** (3) Ozdogan

Advanced studies in ceramic murals and sculpture oriented toward indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, $54.

231–32 **Design III** (3–3) Gates

New media and techniques in three-dimensional design. Laboratory fee, $24 per semester. (Academic year)

234 Design IV (3) Staff
Specifications and fabrication of materials in three-dimensional presentation. (Fall and spring)

235 Design V: Textile Printing (3) Teller
Designing and executing textiles using the techniques of silk screen, block print, and batik. (Fall and spring)

248 Independent Research in Fine Arts (3)
For master's degree candidates; open to limited number of qualified undergraduates, with permission. Independent research arranged in consultation with individual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.* (Fall and spring)

249 Theory of Design (3) Costigan
Application of design principles to problems of the artist in all disciplines. Emphasis on individual creativity, presentation, and criticism. Guest lectures on issues in contemporary art. Open to all MFA candidates and to seniors with permission of instructor. Laboratory fee, $9.

251–52 Ceramics IV (3–3) Ozdogan
Advanced individual projects. Directed studies in specific areas. Laboratory tests and activities. Laboratory fee, $54 per semester.

253 Ceramics V (3) Ozdogan
Establishment of an individual style and specialization. Emphasis on meeting professional standards. Laboratory tests and activities. Laboratory fee, $54.

254 Ceramic Glazes: Calculation and Formulation (3) Glassman
Laboratory fee, $21.

255–56 Graphics IV: Advanced Serigraphy (3–3) Teller
Utilization of principles and techniques of serigraphy toward development of personal statement and style. Prerequisite: Art 143–44. Laboratory fee, $21 per semester. (Academic year)

257–58 Graphics V: Etching and Engraving (3–3) Griffith
Prerequisite: Art 157–58. Material fee, $21 per semester. (Academic year)

259 Graphics VI: Lithography (3) Wright
Material fee, $21. (Fall and spring)

260 Graphics VII: Relief Printing (3) Griffith
Material fee, $21. (Fall and spring)

265–66 Painting IV (3–3) Woodward
Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, $15 per semester. (Academic year)

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* *Schedule of Fees*: Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$21; Graphics—$21; Sculpture—$24; Typography—$30; Painting—none; Photography—$36; Visual Communication—$30; Serigraphic Techniques—$21.

267–68 **Individual Problems in Photography** (3–3) Lake and Staff
Limited to MFA candidates and qualified undergraduates. Prerequisite: Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, $36 per semester. (Academic year)

275 **Painting V** (3) Woodward
Development of personal imagery. Individual problems and critiques. Material and model fee, $15.

277–78 **Advanced Visual Communication** (3–3) Molina
Design and execution of graphic design projects, including magazine spreads, posters, advertisements, trademarks, letterheads, packages. Psychological and symbolic aspects of design solutions. Laboratory fee, $30 per semester. (Academic year)

279–80 **Sculpture IV** (3–3) Gates
Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, $24. (Academic year)

281 **Sculpture V** (3) Gates
Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, $24. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
Laboratory fee depending on area chosen.* (Fall and spring)

ART THERAPY—GRADUATE PROGRAM

Professors B.I. Levy *(Program Director)*, D.E. Silber *(Associate Director)*
Adjunct Associate Professors H.Y. Kwiatkowska, E. Ulman *(Coordinator of Training)*, E. Kramer, J. Krash
Assistant Professor A.R. Bruhn *(Assistant Director)*
Adjunct Assistant Professors W. Maiorana, M. Fleming, P.A. Rossiter-Ravenscroft
Lecturers K. Williams, A.J. Evans, L. Gantt
Clinical Instructors B.J. Clifford, S. Fishman, G. Haugan, R.A. Wolff, M.S. Schmal, B. Holly, Jr., M. Kreshover

Master of Arts in the field of art therapy—Prerequisite: a bachelor's degree, evidence of significant training and/or experience in art, including painting, drawing, and clay modeling; course work in the behavioral and/or social sciences, including personality theory, abnormal psychology, and child psychology.

Required: the general requirements, pages 91–99. Prospective candidates should consult the brochure which describes the program for specific requirements.

Fields of emphasis: adult art therapy, family art therapy, child art therapy, and research.

* *Schedule of Fees:* Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$21; Graphics—$21; Sculpture—$24; Typography—$30; Painting—none; Photography—$36; Visual Communication—$30; Serigraphy—$21.

201 Introduction to Art Therapy (3) Ulman

Lectures, presentation of illustrative case material, class discussion of assigned readings. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to degree candidates. (Fall)

202 Case Studies in Art Therapy (3) Ulman

Discussion of case material provided by students in order to refine methods of working, improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading (Spring)

203 Technique of Art Therapy (3) Gantt

Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to degree candidates. (Fall)

204 The Freudian Model in Art Therapy (3) Kramer, Kwiatkowska, Ulman

Concepts of instinctual drives; ego development; defense mechanisms; sublimation; transference and countertransference; maturation and regression applied to work with children, adults, families, and groups. (Spring)

205–6 Family Art Techniques (3–3) Kwiatkowska

Principles of family art therapy as adjunctive and primary treatment; art techniques for evaluation of family dynamics. Students participate in working with families. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Academic year)

207–8 Art as Therapy with Children (3–3) Maiorana, Williams

Lectures, presentation of case material, studio work, class discussion of assigned reading. Special considerations of work in art therapy with children will be explored from the theoretical and practical standpoints. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Academic year)

211 Survey of Art Therapy (3) Maiorana, Williams, Evans

Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. For students not intending to specialize in art therapy. Open to advanced undergraduates with permission of instructor. (Fall and spring)

218 Seminar: Systems of Psychotherapy (3) Silber

Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Spring)

275 Group Art Therapy (3) Williams

Theory of group process; experience in an art-centered group. Application of group process theory and experience to the practice of group art therapy. May be repeated for credit. (Fall and spring)

283–84 **Practicum in Art Therapy** (3–3) **Staff**

Minimum of 300 hours' field work connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203, or 211. Open only to degree candidates.

285 **Special Projects in Art Therapy** (3) **Staff**

Individual work based on study, research, or practice. Details to be worked out with each student. Resource people may be called upon to assist, as appropriate. May be repeated for credit with approval of advisor.

290–91 **Workshops in Art Therapy** (3–3) **Staff**

Art therapists and other mental health professionals will conduct four weekend workshops during each semester. Emphasis on the elucidation of concepts of treatment through lecture, discussion, and participation. Students may register for either 290 or 291, or both. (Academic year)

ASTRONOMY

See **Physics.**

BIOCHEMISTRY—GRADUATE PROGRAMS

Professors B.W. Smith, G.V. Vahouny, J.M. Bailey, A.L. Goldstein *(Chairman)*
Associate Professors G.A. Walker, L.L. Gallo

Master of Science in the field of biochemistry—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Phys 1, 2.

Required: the general requirements, pages 91–99, including Bioc 221–22, 227, 299–300. The remaining courses are to be selected from Bioc 229, 232, 241, 262, 295; or, with the approval of the advisor, from graduate courses in chemistry, microbiology, physiology, or pharmacology. It is expected that students will complete all of the required work in approximately two years.

Doctor of Philosophy in the field of biochemistry—Required: the general requirements, pages 91–93, 99–101.

Research fields: Prostaglandin synthesis and metabolism; regulation of cholesterol metabolism; atherosclerosis; mechanisms of fat and cholesterol absorption and transport; dietary fibers; chemical and biological properties of thymosin; endocrine role of the thymus gland; hormonal control of immunity; biochemistry of lymphoid tissue; biochemistry of aging; ribosome metabolism; molecular biology; steroidogenesis; mechanism of action of the B_{12} coenzymes; free radical chemistry; molecular biology of the gene; isolation and sequence analysis of factors involved in immune systems; vitamin C and immunity; biochemistry of cancer; biochemistry of tissue culture; carbohydrate metabolism; chemistry and metabolism of lipids, proteins; complex lipids; endocrinology; intermediary metabolism; neurochemistry; nutrition; protein biosynthesis and metabolism; tissue respiration; vitamins.

221-22 **General Biochemistry** (3–4) Gallo and Staff

A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Generally, graduate students must register concurrently for Bioc 223 and for Bioc 224. However, graduate students taking Bioc 225–26, ForS 281–82, Micr 241–42 or Phys 223–24 may register for Bioc 221–22 without the laboratory. With specific recommendations by the undergraduate advisor and the department, undergraduate students may register for Bioc 221–22 without laboratory. Prerequisite: Chem 152, 154. (Academic year)

223–24 **Biochemistry Laboratory** (1–1) Gallo and Staff

Laboratory complement of Bioc 221–22. Concurrent registration in Bioc 221-22 required. Materials fee, $20 a semester. (Academic year)

225–26 **Introduction to Biochemical Research** (arr.) Smith and Staff
(Formerly Biomedical Instrumentation)

Rotation through research projects in laboratory units within the Biochemistry Department to provide individualized in-depth training in the methods and instrumentation used in those units. Limited to students in the Department of Biochemistry graduate program. (Academic year)

227 **Biochemistry Seminar** (1) Bailey

Current literature in biochemistry. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (1) E. Anderson

Two separate courses are offered in alternate years, each covering both general and advanced material; students may register for these in either order and cover the entire content in two years. The full content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 221. (Fall)

232 **Protein Chemistry I** (1) Steers, Schechter

An introduction to the theory and methods of protein chemistry, including techniques of protein purification, sequencing and characterization by physico-chemical methods. Prerequisite: Bioc 221. (Fall)

233 **Protein Chemistry II** (1) Steers, Schechter

Continuation of Bioc 232. The study of structure-function relations in proteins, including methods of analysis of conformation, enzymatic activity and the role of proteins in various biological processes. (Spring)

241 **Isotopes** (3) Staff

Theoretical characterization of isotopes and their application in biology and medicine. Attention given to counting, health physics and radiation safety, autoradiography, chromatography. Laboratory fee, $16. (Spring)

252 **Biochemistry of Nervous Tissue Function** (2)

A detailed investigation of the basic biochemical mechanisms involved in nervous tissue function. Topics to be discussed include the molecular structure and function of nervous tissue: intra- and

inter-neuronal communication mechanisms and brain metabolism; and the biochemistry of various brain dysfunctions. (Spring)

254 **Human Nutrition** (1)

For medical students; open to limited number of graduate students. Application of nutritional principles in humans. (Spring)

256 **Biochemistry of Organ Function** (1) N. Kramer*

For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

262 **Biochemistry of the Lipids** (1) Vahouny

Discussion of topics of current interest, including digestion, energy production, biosynthesis, function in specialized tissues, and subcellular particles. Content differs each time course is offered; may be repeated for credit. (Spring)

264 **Membrane-Associated Complex Lipids** (1) P. Fishman†

Topics will cover the catabolism and biosynthesis of complex sphingolipids; inherited metabolic diseases associated with abnormal sphingolipid metabolism; altered glycosphingolipid biosynthesis associated with malignant transformation; potential roles of gangliosides as membrane receptors for toxins and hormones; aspects of membrane structure and biochemistry. (Spring)

266 **Biochemical Genetics and Inherited Metabolic Diseases** (1) C. Merril

For medical students; open to limited number of graduate students. Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. (Spring)

268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Joint offering of the Physiology and Biochemistry Departments. Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: an introductory course in biochemistry and physiology, or permission of the department. (Spring)

270 **Biochemistry of the Immune Response** (2) Staff

For advanced graduate students. Immunoglobulin structure, function, and regulation; complement system; biochemistry of mediators of cellular immunity; and molecular biology of the differentiation of the immune system. Prerequisite: Bioc 221–22. (Spring)

295 **Research in Biochemistry** (arr.) Staff

Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

* Dr. Kramer is Professor of Medicine in the G.W.U. School of Medicine and Health Sciences.
† Dr. Fishman is Professorial Lecturer in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BIOLOGICAL SCIENCES

Professors R.L. Weintraub *(Emeritus)*, K.F. Parker *(Emeritus)*, S.O. Schiff *(Chairman)*, D.L. Atkins, R.K. Packer
Adjunct Professors T.E. Bowman, M.L. Jones, L.S. Kornicker, H.A. Rehder, F.A. Chace, Jr., R. Manning, C.G. McWright
Professorial Lecturers W.A. Shropshire, Jr., J.C. Petricciani, C.F. Cleland
Associate Professors R.E. Knowlton, H. Merchant, T.L. Hufford
Adjunct Associate Professors W.D. Hope, D.L. Pawson, J. Rosewater, C.F. Roper, M. Rice
Associate Professorial Lecturers P.E. Spiegler, J.C.C. Dickens, B.M. Timberlake, D.A.P. Houston, D.J. Picciano
Assistant Professors R.P. Seifert, D.E. Johnson, A.L. Mescher, R. Donaldson, J.R. Burns, E.F. Wells
Assistant Professorial Lecturer R.L. Phipps

Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the humanities.)
2. Prerequisite courses—BiSc 11–12, or equivalent.
3. Required courses in related areas—Chem 11–12; Chem 151–52 and 153–54, or 50. (The following courses are strongly recommended: Math 31; Phys 1, 2; two years of French, German, or Russian; Stat 91 or 127.)
4. (a) Required courses for the major in biology—a minimum of 24 semester hours of second-group courses, which should include at least six hours in biology, six in botany, and six in zoology.
   (b) Required courses for the major in botany—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included.
   (c) Required courses for the major in zoology—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.
5. The Bachelor of Science degree requires two semesters of introductory physics with lab in addition to the requirements listed above.

Minor in biology—12 semester hours of second-group courses,* which must include at least 3 hours in biology, 3 in botany, and 3 in zoology.

* BiSc 171 through 176 do not count toward fulfillment of the 12-hour second-group course requirements.

Minor in botany—12 semester hours of second-group courses,* of which 8 hours must be in botany.

Minor in zoology—12 semester hours of second-group courses,* of which 8 hours must be in zoology.

Master of Science in the field of biology, botany, or zoology—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50; Math 31; Phys 1, 2.

Required: the general requirements, pages 91–99. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). With the permission of the department a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Master of Arts in the field of Museum Studies, with specialization in the biological sciences, see pages 391–94.

Doctor of Philosophy in the field of biology, botany or zoology—Required: the general requirements, pages 91–93, 99–101, plus satisfactory completion of a Preliminary Examination and the General Examination in four areas of biology. The program of study, fields of study, and tool subjects are determined in consultation with an advisory committee appointed for each candidate.

Research fields in Biology: cell physiology, cytogenetics, developmental genetics, and molecular genetics.

Research fields in Botany: photobiology, phycology, plant ecology, plant physiology (microorganisms), plant physiology (vascular plants), and taxonomy.

Research fields in Zoology: animal ecology, bioenergetics; comparative neuroanatomy; comparative physiology; herpetology; histophysiology; invertebrate zoology; marine biology; radiation biology; taxonomy, anatomy and physiology of mollusks; vertebrate anatomy and taxonomy; vertebrate embryology and morphogenesis; vertebrate ichthyology; and vertebrate physiology.

Bachelor of Arts in Education and Human Development with a teaching field in biology—Prerequisite: the education curriculum, page 114.

Required: the biology option and the professional courses listed on page 117.

Departmental prerequisite: BiSc 11–12 or equivalent is prerequisite to all second-group courses in biology, botany and zoology, except by permission of the instructor.

BIOLOGY

First Group

3–4 Introductory Biology for Nonscience Majors (3–3) Schiff

Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in the environment. Prerequisite to BiSc 4: BiSc 3. Material fee, $18 per semester. (Academic year)

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* BiSc 171 through 178 do not count toward fulfillment of the 12-hour second-group course requirements.

11–12 **Introductory Biology for Science Majors** (4–4) Hufford, Merchan

Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concept and principles are demonstrated through consideration of the plan as an organism. BiSc 12: Beginning principles of inheritance, develop ment, behavior, physiology, systematics, and evolution, using animal as the subject of investigation; designed to furnish a base for ad vanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester. (Academic year)

26 **Environmental Issues** (3) Merchant

Joint offering of the Division of Experimental Programs and the De partments of Biological Sciences and Geography and Regional Science. An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environ mental problems, issues of economic growth and development, tech nology and public policy. (Fall and spring)

33 **Plants and People** (3) Hufford

A study of the multidimensional relationship between plants and people, past and present. Lectures, observation-discussion sessions, multi-image audiovisual presentations. (Spring)

Second Group

103 **Marine Biology** (4) Knowlton

Lecture (2 hours), laboratory and field (3 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Con sideration of the open ocean and coastal eco-systems and man's in fluence on them. Recommended prerequisite: BiSc 101 or 102, 106, 140. Material fee, $24. (Spring)

107 **Field Biology** (4) Merchant

Field study of altitudinal zonation, species hybridization, territorial ity, energy balance, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer)

108 **Organic Evolution** (3) Seifert

Synthetic theory of organic evolution including treatment of specia tion, adaptive radiation, biogeography, population biology, sociality, and human evolution. (Spring)

111 **Introductory Microbiology** (4) Staff

Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $24. (Fall and spring)

122 **Cell Biology** (3) Donaldson

Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Spring)

123 **Cell Biochemistry** (3) Donaldson

Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, bio-

syntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Fall)

124 **Cell Biochemistry Laboratory** (2) Donaldson

Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Material fee, $24. (Fall)

127 **Genetics** (3) Johnson

Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action. (Fall and spring)

128 **Genetics Laboratory** (1) Johnson

Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $24. (Fall and spring)

138 **Advanced Genetics** (3) Johnson

Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

140 **General Ecology** (4) Merchant

Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer, and their relationship to the structure and function of population, species, communities, and ecosystems. Material fee, $24. (Fall)

144 **Aquatic Ecology** (4) Merchant

Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physiochemical properties, typical habitats and communities. Laboratory fee, $24. (Spring, odd years)

167 **Radiation Biology** (3) Schiff

Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals; genetic effects. Recommended: two years of biological sciences, and chemistry or physics. (Fall)

171 **Undergraduate Research** (arr.) Staff

Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152; 16 semester hours in Biological Science courses. Material fee, $20 per semester hour. (Fall and spring)

172 **Independent Study in Cell and Molecular Biology** (2) Staff

Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

173 **Independent Study in Developmental Biology** (2) Staff

Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

174 **Independent Study in Organismic Biology** (2) Sta
Prescribed reading list and consultations with staff advisor culmina ing in a written report and/or examination. Prerequisite: permissi of instructor. (Fall and spring)

175 **Independent Study in Genetic and Evolutionary Biology** (2) Sta
Prescribed reading list and consultations with staff advisor culmina ing in a written report and/or examination. Prerequisite: permissi of instructor. (Fall and spring)

176 **Independent Study in Environmental Biology** (2) Sta
Prescribed reading list and consultations with staff advisor culmina ing in a written report and/or examination. Prerequisite: permissi of instructor. (Fall and spring)

181–82 **Senior Seminar** (1–1) Sta
Lectures and discussions on current biological problems. (Aca demic year)

185 **Human Nutrition** (3) Donaldso
Dietary requirements and their underlying physiological and bio chemical bases; composition of natural and modified foodstuffs an additives; social and economic aspects of nutrition. (Fall)

Third Group

206 **Seminar: Radiation Biology** (3) Shropshir
Actions of radiation at subcellular, cellular, and organismal levels factors modifying radiation damage; practical considerations in radia tion exposure. Prerequisite: BiSc 167 or equivalent. (Spring)

207 **Seminar: Origin of Life** (3) Staf
Review of experiments and speculations concerning origin of life and molecular aspects of biological evolution. (Spring, odd years)

208 **Bioenergetics** (3) Merchant
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions Prerequisite: BiSc 140 or equivalent. (Fall, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Seifer
Principles and mechanisms of evolution in animals and plants; popu lation phenomena, speciation, and evolution above the species level (Fall, even years)

220 **Seminar: Cell or Plant Biochemistry** (3) Donaldso
Course content changes each session, alternating between selecte topics in cell biochemistry and plant biochemistry. May be repeate for credit. (Spring, even years)

227 **Seminar: Genetics** (3) Johnso
Current problems in genetics. Students are required to present on seminar covering the full class period. May be repeated for credi (Fall, odd years)

228 **Population Genetics** (3) Johnson
Consequences of Mendelian inheritance on the population level as exemplified by gene frequencies, random mating, inbreeding, differential fertility and mutations. (Fall, even years)

229 **Cytogenetics** (3) Staff
Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. (Fall)

230 **Human Genetics** (3) Picciano
Genetic mechanisms of transmission and expression of human traits, with emphasis on biochemical and cytogenetic aspects. Prerequisite: BiSc 127 or equivalent; previous course work in cell biology or cell biochemistry strongly recommended. (Spring)

237 **Water Pollution Biology** (3) Hufford
Review of current research in water quality and water pollution biology. (Fall, even years)

243 **Seminar: Ecology** (3) Merchant
In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Mescher
Survey of current research in experimental morphology, developmental genetics, biochemical development, and developmental endocrinology. Prerequisite: BiSc 146 or equivalent. (Fall)

249 **Seminar: Developmental Biology** (3) Mescher
Discussion and reports on current literature in developmental biology, with emphasis on developmental genetics. Prerequisite: at least one course each in developmental biology and genetics. (Spring)

255 **Seminar: Consortium Biology** (2)
Topic to be announced in *Schedule of Classes*. (Spring)

295 **Research** (arr.). Staff
Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BOTANY

Second Group

105 Local Flora (4) We

Lecture (2 hours), laboratory and field (4 hours). Field and laborato studies on local flora; emphasis on the woody plants. Material f $20. (Fall)

106 Field Botany—Lower Plants (4) Huffo

Lecture (2 hours), laboratory and field (4 hours). Primarily for no specialists, emphasizing algae, mosses, and ferns. Material fee, $ (Alternate summers)

109 Developmental Plant Anatomy (4) Huffor

Demonstration, observation, discussion (6 hours). Initiation a ontogeny of tissues and organs of vascular plants. Material fee, $2 (Spring)

110 Comparative Plant Morphology (4) Huffor

Demonstration, observation, discussion (6 hours). Evolutionar morphology and life histories as a basis for a phylogenetic study an the critical roles plants have in human welfare. Material fee, $2 (Fall)

125 Flowering Plants (4) Well

Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionar development, and principles of systematics of flowering plants. Mate rial fee, $20. (Spring)

135 Plant Physiology (4) Donaldso

Lecture (2 hours), laboratory (4 hours). Physiology of seed plant with emphasis on growth, development, tropisms, and reproductio Prerequisite: Chem 11–12. Recommended: Chem 50 or 151–52. Mate rial fee, $24. (Spring, odd years)

137 Horticulture (4) Staf

Lecture (2 hours), laboratory (4 hours). Basic principles of growth propagation, and care of ornamental plants. Material fee, $20 (Fall and spring)

141 Plant Ecology (4) Wells

Lecture (2 hours), laboratory (4 hours). Several Saturday and weekend field trips required. Material fee, $18. (Spring)

149 Freshwater Algae (4) Hufford

Observation and discussion (6 hours). Systematics, morphology physiology, and water quality interrelationships of freshwater algae Field experience, including at least one weekend field trip. Materia fee, $18. (Fall, odd years)

Third Group

221 Seminar: Systematics of Flowering Plants (3) Wells

Review of current work in various disciplines of systematic research topics of special interest to participants. May be repeated for credit (Fall, odd years)

238 **Seminar: Current Topics in Phycology** (3) Hufford
(Spring, odd years)

242 **Seminar: Plant Ecology** (3) Wells
(Fall, even years)

251 **Freshwater Diatoms** (4) Hufford
Observation and discussion (6 hours). Taxonomy, morphology, and ecology of freshwater diatoms. Field experience. Material fee, $20. (Spring, even years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ZOOLOGY

Second Group

101 **Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory (4 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Material fee, $24. (Fall)

102 **Advanced Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory and field (4 hours). Study of invertebrate systems (cells, tissues, organs, organisms), with emphasis on functional aspects (physiology and ecology) and taxonomy of important groups. Prerequisite: BiSc 101 or equivalent. Material fee, $24. (Spring)

104 **Comparative Vertebrate Anatomy** (4) Atkins
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $24. (Fall and spring)

120 **Animal Behavior** (3) Staff
Principles of animal behavior, including mechanisms and manifestations from simple reflex systems to social interaction. (Spring, even years)

143 **Animal Ecology** (4) Merchant
Lecture (3 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $24. (Spring, even years)

145 **Introduction to Vertebrate Embryology** (4) Mescher
Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $24. (Fall)

146 **Experimental Developmental Biology** (4) Mescher
Lecture (2 hours), laboratory (4 hours). Introduction to the experimental, biochemical, and genetic analysis of developing systems

through examination of the literature and laboratory experiments. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology or genetics and Chem 50 or 151–52. Laboratory fee, $24. (Spring)

148 Histology (4) Burns

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24. (Spring; fall, odd years)

153 Survey of Neurobiology (4) Atkins

Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system; emphasis on mammals. Prerequisite: BiSc 104. Material fee, $24. (Fall)

155 Parasitology (4) Staff

Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology; survey of parasitic types from protozoa through arthropods. Material fee, $20. (Fall, even years)

156 Ichthyology (4) Packer

General biology of fishes, including structure, function, distribution and evolution, with emphasis on adaptations. Prerequisite: background in comparative anatomy and vertebrate zoology, or permission of instructor. Lecture (3 hours), laboratory (2 hours). Material fee, $20. (Fall, even years)

157 Comparative Endocrinology (4) Burns

Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuro-endocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 165 and/or concurrent registration in Chem 151–52 or Chem 50. Material fee, $24. (Fall)

161 Entomology (4) Seifert

Lecture (2 hours), laboratory (4 hours). The biology of insects, including their morphology, physiology, development, behavior, and ecology. Material fee, $20. (Fall)

162 Insect Population and Evolutionary Biology (4) Seifert

Lecture (3 hours), laboratory (3 hours). Study of the interactions of insects with other organisms and the effects these interactions have on insect evolution. Insects as disease vectors and as pollinators, and mimetic systems will be discussed. Prerequisite: BiSc 108, 140, or 161, or permission of instructor. Material fee, $20. (Spring, even years)

163 Human Physiology (3) Packer

Introduction to the function of organ systems of the human body. (Fall)

164 Human Physiology Laboratory (1) Packer

Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $28. (Fall)

165 Vertebrate Physiology (4) — **Packer**

Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $28. (Spring)

Third Group

204 Seminar: Invertebrate Zoology (3) — **Knowlton**

Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. (Fall)

205 Comparative Pathology (3) — **Zook**

Joint offering of the Biological Sciences and Pathology Departments. An introduction to the study of disease and disease mechanisms in vertebrates, and comparison with disease in man. Recommended: courses in anatomy, histology, and physiology. (Fall)

211 Adaptation and Natural Selection (3) — **Seifert**

An examination of special evolutionary problems and conflicts as well as peculiar adaptive characters of certain species. These include the evolutionary basis of sociality, sex, maleness and femaleness, and the conflict between individual and population survival. Prerequisite: BiSc 108 or permission of instructor. (Spring, odd years)

212 Seminar in Comparative Reproductive Biology (3) — **Burns**

Review of selected topics in animal reproduction, including neuroendocrine regulation, reproductive cycles and behavior, and gonadal pathology. (Spring)

252 Seminar: Neurobiology (3) — **Atkins**

Study of current publications in comparative neurobiology. (Spring, even years)

253 Evolution of the Nervous System (4) — **Atkins**

Invertebrate and vertebrate nervous systems. The development of increasing complexity in neurons and systems of neurons, and the establishment of alternate pathways to accomplish particular functions. Lecture and laboratory. Prerequisite: BiSc 153. Material fee, $24. (Spring, odd years)

256 Fish Physiology (3) — **Packer**

A survey of major organ systems and homeostatic mechanisms of fishes with emphasis on teleosts. Prerequisite: BiSc 163 or 156 or equivalent. (Spring, odd years)

265 Comparative Animal Physiology (3) — **Packer**

Survey of the physiological basis of adaptation of animals to diverse environments, emphasis on nonmammalian vertebrates. Prerequisite: BiSc 165 or equivalent. (Fall)

299–300 Thesis Research (3–3) — **Staff**

(Fall and spring)

BUSINESS ADMINISTRATION

Professors R.B. Eastin, E. Timbers, H.R. Page, F. Amling, G. Black, Grub, G.P. Lauter, J. Zwick, N.M. Loeser, A. El-Ansary, W.J. Kee B. Burdetsky, S.F. Divita *(Chairman)*, R. Eldridge, R.F. Dyer, V Handorf
Professorial Lecturers J.P. Murphy, S. Thurm, F.E. McLaughlin
Associate Professors S.N. Sherman, C.R. Miller, H.J. Davis, E.L. Hullar *(Visiting)*, F. Ghadar, E. Yecheskel *(Visiting)*, J.M. Sachlis
Associate Professorial Lecturers D.A. Peterson, R.L. Schweitzer, A Pieruccini
Assistant Professors T.M. Barnhill, D.R. Kane, P.B. Malone III, W.D. Bre man, N.G. Cohen
Adjunct Assistant Professor J.R. Carey
Assistant Professorial Lecturers M.W. Hudgins, C.C. Shepherd
Instructor M.L. Slagle *(Visiting)*
Adjunct Instructors C.A. Allen, R.P. Hill

Programs of study in business administration leading to the degrees of *Bache of Business Administration, Master of Business Administration, and Doctor Business Administration* are offered by the School of Government and Busine Administration (see pages 134–64).

First Group

51 Introduction to Business (3) Davis, Pa
Structure, activities, and problems of business enterprise; its cont bution to the individual and to society; careers in business. (Fa and spring)

Second Group

101 The Business Environment (3) Slag
Economic and legal environment of business enterprise; social an political influences; contemporary problems and issues. Restricted seniors in the BBA program or with permission of instructor. (Fa and spring)

102 Fundamentals of Management (3) Davi
Planning, organizing, directing, coordinating, and controlling activitie of the administrative unit; evolution of management thinkin (Fall and spring)

105 Personnel Management (3) Burdetsky, Malon
The labor force and labor markets. Industrial personnel and ma power programs, organization and policy in personnel activitie (Fall and spring)

106 Leadership in Personnel Management (3) Burdetsk
A study of the philosophy, principles, policies, and programs f effective personnel management and industrial relations as portray by case studies drawn from business and government. Prerequisit BAd 105 or permission of instructor. (Fall)

107 Collective Bargaining (3) Burdetsky

American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 105 or permission of instructor. (Spring)

113 Real Estate Investment (3) Handorf, Barnhill

Principles of real estate investment including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 131. (Fall)

121 Fundamentals of Insurance and Risk Management (3) Staff

Function of insurance and risk management in business enterprise. (Fall)

131 Business Finance (3) Barnhill, Handorf, Sachlis

Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management, financial analysis, sources of funds, capital budgeting, stockholder relationships. Prerequisite: Acct 1–2; Econ 1; Math 30, 31; Stat 51. (Fall and spring)

132 International Business Finance (3) Eldridge, Hudgins

Analysis of the international economic environment and its influence on corporate financial management of international operations. (Fall and spring)

133 Capital Formation (3) Handorf

The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 131. (Spring)

138 Investment and Portfolio Management (3) Amling

Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: Acct 1–2, BAd 131. (Spring)

139 Advanced Financial Management (3) Barnhill, Handorf

Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financings, dividend policy, and other special topics in finance. Prerequisite: BAd 131.

141 Basic Marketing Management (3) El-Ansary, Dyer, Carey, Perry

Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2, Stat 51. (Fall and spring)

143 Marketing Research (3) Dyer

Basic methods and techniques of marketing research, problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: attitude research, questionnaire construction and concept testing. Prerequisites: BAd 141, Stat 51, Mgt 118. Laboratory fee, $15. (Fall and spring)

144 **International Marketing Management** (3) El-Ansary, Lau

Scope of international markets; factors in assessing world market opportunities; international marketing product, pricing, distributi and promotion program development in dynamic world markets a global environment. Prerequisite: BAd 141. (Fall and spring)

145 **Sales Management** (3) St

Organization of sales department, sales planning and forecastin quotas, territories, performance standards, and analysis and contr of distribution costs. Prerequisite: BAd 141, 143, 146. (Fall)

146 **Consumer Behavior** (3) Dy

An examination of the social, cultural, and psychological factors i fluencing the behavior of consumers. Topics include: models of buy behavior, consumption patterns, market segmentation research, att tude formation and change, brand loyalty, the adoption of innovation and store choice decisions. Marketing management and public polic implications of consumer research studies are stressed. Prerequisit BAd 141 or permission of instructor. (Fall and spring)

147 **Advertising** (3) Thurm, Dye

Planning an advertising campaign. Consumer and market information message appeals, media selection and scheduling, measuring effective ness. Current criticism and regulation of the advertising function Other major marketing communication tools, including personal sell ing and sales promotion, presented. Prerequisite: BAd 141, 143, 146 (Fall and spring)

148 **Retailing Management Seminar** (3) El-Ansary

A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations an case analyses. Prerequisite: BAd 131, 141, 146. (Spring)

149 **Marketing: Strategic Planning** (3) Divita, El-Ansary, Keegan

A capstone seminar for marketing group option students. Analytical integration of material covered in previous marketing courses. Mar keting strategy literature, financial dimensions of marketing manage ment, and comprehensive cases. Prerequisite: BAd 141, 143, 145, 146 and one additional marketing group option course. (Spring)

161 **Commercial Law** (3) Murphy, Breneman, Kane

Fundamental concepts and principles of law encountered in business activity; contracts, bailments, agency, sales, negotiable instruments bankruptcy, other topics. Basic legal considerations in business de cision-making. (Fall and spring)

171 **Transportation and Logistics Management** (3) Sherman

Systems and alternatives of the logistics manager; carrier, user, and public policy perspectives: urban and inter-city mobility; cost, rate competition, and service problems; public financing and regulation o carrier enterprise; coordination of the modes of transportation. (Fall)

175 **Introduction to International Business** (3) Grub, Hudgins

Social, cultural, political, legal, and technological environment o multinational business, emphasizing host-government/multinationa

corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation, and legal requirements; physical movement of goods in international business. (Fall and spring)

176 **International Business Theory and Policy** (3) Eldridge

Theoretical relationships underlying international business transactions, governmental and corporate policy, significant trends and their causes. (Fall and spring)

178 **International Business Policy and Operations** (3) Grub

Integration of functional activities in international and multinational firms, through selected case studies and discussions, to develop and stimulate decision-making from an overall business policy standpoint. Prerequisites: BAd 175 and advanced undergraduate standing. (Fall and spring)

181 **Manufacturing Production** (3) Hullander

Basic principles and methods of manufacturing production. Manufacturing facilities, plant and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent; BAd 102, 105. (Fall and spring)

182 **Small-Business Management** (3) Staff

Theory and practice of small business management. Focus on effective management of small firms, essentials of planning and organizing the firm, financial and administrative controls, evaluation of alternative business forms, and comparison of purchase of an on-going firm, franchising, and new business start-ups. The role of small business in American society; historical perspective of entrepreneurship. Prerequisite: BAd 102.

190 **Special Topics in Business Administration** (3) Staff

Experimental offering; new course topics and teaching methods.

198 **Business Policy and Administration** (3) Eastin, Loeser, Page

Integration of functional activities in arriving at overall business policy decisions. Prerequisite: BAd 102, 105, 131, 141, 181. (Fall and spring)

199 **Individual Research** (arr.)

Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

Third Group

201 **Social and Legal Environment of Business** (3) Breneman, Kane

This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Contemporary social forces acting on business management: business responsibility, ethics. Business under the U.S. Constitution, federal legislation, legal precedents and agency orders. Emphasis on court decisions relating to business. (Fall and spring)

202 **Business-Government Relations** (3) Black

Economic, political, and philosophical foundations of the business-government relationship in theory and practice. Antitrust, public

utility, and other regulation, consumer and environmental protectio conditions of employment; effective business response—prese status and future prospects. Prerequisite: BAd 201. (Fall a spring)

204 Legal Aspects of International and Multinational Business (3) Peterse

Legal environment of international and multinational business i cluding legal systems, antitrust laws, regulation of direct investmen international arbitration and expropriation; topics of current interes (Fall and spring)

205 Business Representation and Lobbying (3) Blac

Strategies, tactics, and techniques used by business in representin itself to the legislative and executive branches and regulatory agen cies of the federal government. Legal and practical constraints Ethical considerations. (Fall)

206 Seminar: Business, Economics, and Public Policy (3) Blac

(Formerly BAd 302)

Analysis and discussion of selected issues by students and repre sentatives of government and business. Prerequisite: BAd 201, 202.

208 Personnel Management (3) Eastin, Loeser

Survey of personnel management practices and procedures, including labor-management relations. (Fall and spring)

209 Seminar: Personnel Management (3) Eastin

Industrial personnel and manpower management, research in ad vanced problems. (Spring)

210 The Personnel Manager (3) Eastin

The personnel manager and his or her place in the organization relation to other executives, policy role and relations with chief executive. Problems of the senior personnel executive. Prerequisite BAd 208 or permission of instructor.

211 Leadership and Executive Development (3) Loeser

Theories of managerial leadership: issues and problems associated with leadership in large organizations and at higher management levels: executive selection and development. Prerequisite: Mgt 200 o permission of instructor. (Fall and spring)

212 Unionism and Collective Bargaining (3) Burdetsky

The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

213 Current Issues in Unionism, Collective Bargaining, and Labor Relations (3) Burdetsky

Current problems and issues. Prerequisite: BAd 212. (Spring)

230 Business Financial Management (3) Handorf, Sachlis, Barnhill, Cohen

This course is a First-Level requirement for MBA students: it may not be used to satisfy a Second-Level requirement. Theory, policy, and practice in financial management: financial analysis, sources of funds investing, capital planning, and budgeting. Prerequisite: Acct 201 Econ 217, Mgt 202 and 218, or equivalents. (Fall and spring)

231 **Financial Decision-making** (3) Handorf, Sachlis

Theory and practice of business finance with emphasis on special topics within valuation, including capital budgeting, mergers, acquisitions, bankruptcy, and liquidation. Prerequisite: BAd 131 or 230. (Fall and spring)

233 **International Business Finance** (3) Ghadar, Pieruccini, Zwick

Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 131 or equivalent. (Fall and spring)

234 **Seminar: Capital Formation** (3) Handorf

Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 131 or 230. (Fall and spring)

235 **Financial Management** (3) Sachlis, Handorf, Amling, Barnhill

Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 231.

236 **Seminar: International Banking** Zwick

International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions and the effect of international banks on national monetary policies. Prerequisites: BAd 233, 234. (Fall and spring)

237 **Investment Analysis** (3) Amling, Cohen

Risk-reward analysis of security investments including analysis of national economy, industry, company, and market; introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 131. Laboratory fee, $15. (Fall and spring)

238 **Seminar: Investment and Portfolio Management** (3) Sachlis, Amling, Cohen

Portfolio management theory, application, and computer modeling. Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. Prerequisite: BAd 237. Laboratory fee, $15. (Spring)

239 **Financial Theory** (3) Sachlis

In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy and the capital asset pricing framework. Prerequisite: BAd 231, 237. (Fall and spring)

240 **Marketing Management** (3) Dyer, El-Ansary, Keegan, Perry, Divita

This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level Requirement. Emphasis on the marketing process from the viewpoint of the firm. Market analysis, product planning, channels of distribution, pricing, and promotional decision-making; developing an integrated marketing plan. Prerequisite: Econ 217–18. (Fall and spring)

241 **Advanced Marketing Management** (3) Divita, El-Ansary, Ke
For MBA students in concentrations other than marketing. analysis of complex marketing problems. Current developmen marketing practice. The relationship of marketing to environm forces and other business functions. Prerequisite: BAd 240. and spring)

242 **Product/Service Strategy** (3) Dyer, C
Management of the activities involved in marketing new and exi products and services. The innovation system (behavioral and or zational) of product decisions, product planning processes, pro auditing, new products and the law, new product/service tr Marketing of intangibles and services. Prerequisite: BAd (Spring)

243 **Seminar: Marketing Research** (3) D
The marketing research process: designing, conducting, and u market research studies. Survey and experimental designs. analysis with statistical software packages. Laboratory fee: Prerequisite: BAd 240, Mgt 202 and 218, or equivalent. (Fall spring)

245 **Promotion Management/Marketing Communications** (3) D
Examination of promotion mix from a systems perspective suppo by analytical methods and concepts regarding consumer attitu and behavior. Topics: social context of promotion, role of comm cation in marketing, behavioral concepts and communications search, message design, economic and financial criteria, developm of a promotion program. Prerequisite: BAd 240 or permission instructor.

246 **Buyer Behavior** (3) Dy
Examination of theory and recent research concerning buyer decisi processes. Interdisciplinary behavioral science studies on individu family, and organizational purchase behavior are treated. Present potential applications for marketing in the public and private sec are illustrated with cases. Prerequisite: BAd 240 or permission instructor.

247 **Marketing and Public Policy** (3) Divita, McLaugh
Examination of principal areas of public policy formulation affecti marketing practice. Topics: advertising, warranties, product safe health issues, consumer information systems, informal and for redress mechanisms, business responsibilities. Government busin and advocate viewpoints presented. Prerequisite: BAd 240, 245. 246; or permission of instructor. (Fall)

248 **International Marketing** (3) Lauter, Keegan, El-Ans
Organizational structures. Analysis of international markets. Mark entry strategies and product policies. Special issues. Channels distribution, promotional and price policies. Prerequisite: BAd (Fall and spring)

249 **Marketing Strategy** (3) Divita, Keeg
Analysis of complex marketing problems involving policy and o erational decisions; emphasis on creative marketing strate Prerequisite: completion of at least three Second-Level marketi courses or permission of instructor. (Fall and spring)

250 **Industrial and Government Marketing** (3) Divita
(Formerly Marketing to the Government)
Overview of industrial and government markets. Acquisition process, buyer behavior, demand analysis, technology, product/service mix, bid decision and proposals, sales management and promotion, distribution, pricing, and marketing control. Prerequisite: BAd 240. (Spring)

253 **Marketing Channels** (3) El-Ansary
(Formerly Distribution Logistics)
Marketing channels and vertical marketing systems from a managerial viewpoint. Marketing channels viewed as super-organizations requiring planning, organization, coordination, and control. These tasks require an understanding of the channel's task environment, manufacturing, wholesaling, retailing, and physical distribution institutions. Focus on system performance and management of interorganizational relationships among channel institutions. Prerequisite: BAd 240. (Fall)

254 **Regional International Marketing Systems** (3) Lauter
Discussion of the political, economic, legal, and social characteristics of Europe, Japan, Latin America, Asia, the Middle East, Africa, the USSR, Eastern Europe, and China, as they affect the marketing of goods and services in these regions. Identification of appropriate market-entry strategies and discussion of selected case histories. Prerequisite: BAd 240, 248. (Fall and spring)

255 **Multinational Corporations in the World Economy** (3) Zwick, Grub
Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies, relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring)

256 **Seminar: International Trade** (3) Eldridge
Classical and modern concepts of international trade theory, instruments and institutions of trade policy, barriers to trade, preferential treatment and trading blocs, trends and issues. (Fall and spring)

258 **External Development Financing** (3) Ghadar
Problems and alternative solutions for required capital formation and the financing of payment imbalances through external sources. Institutions and instruments for financing national development. Emphasis on planning as affected by energy policies, inflation, recession, changes in the international monetary system and revised attitudes among developed countries regarding bilateral and multilateral assistance. Prerequisite: BAd 233 or permission of instructor. (Fall and spring)

259 **International Business Negotiations** (3) Ghadar
This course focuses on the essential characteristics of International Business Negotiations (IBN) with particular emphasis on the process and changes in that process over time. Formulation of concepts and preliminary frameworks to assist in understanding IBN; development of systematic approaches to planning for and conducting IBN. The course assists in developing skills of the participants in the art of IBN while integrating other functional and international aspects in the broader environmental framework. Prerequisite: BAd 255. (Fall and spring)

261 **Applied Microeconomics** (3) Black

Applications of economic theory to public and private decisions affected by the economic and general business environment. Demand, production, costs, profits, investments, inventory, market structure. Prerequisite: Econ 217 and Mgt 202 or equivalents. (Spring)

262 **Macroeconomic Policy and Business** (3) Black

(Formerly Applied Macroeconomics)

Interpretation of economic conditions in the short- and long-run; theory and practice of monetary and fiscal policy; applications of business conditions analysis to business planning, management and policy. Prerequisite: Econ 218 and Mgt 202 or equivalents. (Fall)

279 **Purchasing and Materials Management** (3) Page

Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies and ethics. (Fall)

280 **Procurement and Contracting** (3) Sherman

Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. (Fall and spring)

282 **Government Contract Administration** (3) Sherman

Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Prerequisite: BAd 280 or permission of instructor. (Fall)

283 **Pricing and Negotiation** (3) Sherman

Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Prerequisite: BAd 280 or permission of instructor. (Spring)

285 **Systems Procurement and Project Management** (3) Sherman

Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Developing adequate intercontractual business relationships within the environment of public procurement. Management of projects under contract. (Spring)

290 **Special Topics in Business Administration** (3) Staff

Experimental offering; new course topics and teaching methods. May be repeated once for credit.

292 **New Venture Initiation** (3) Staff

Theory and practice of entrepreneurship and small business management. Historical perspective of entrepreneurship in the U.S. and abroad, essentials of planning a new business venture, sources of financing, evaluation of alternative new business ventures, and analy-

sis of business functions needed to get started. On-going firms, franchising options, and new business start-ups. Prerequisite: Mgt 202, 218; Econ 217–18; BAd 201, 230, 240; Acct 201.

293 **Operations and Logistics Management** (3) Staff

Management of work in production, commercial, service, and public organizations. Analytical tools for planning and establishing operating systems and for their operation, control, and modification. Examination of processes, products, services, equipment, and facilities. Relationships of human systems and operating systems. Prerequisite: Acct 201; Mgt 202, 218; Econ 217–18; BAd 201, 230, 240.

295 **Research Methods** (3) Davis

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

296 **Business Decision Simulation** (3) Staff

Managerial decision-making in a diversified firm in a simulated competitive environment in which a complex situation is played out using computers. Prerequisite: advanced master's or doctoral degree standing.

297 **Business Policy Formulation** (3) Loeser, Keegan, Page

This course is a First-Level requirement for MBA students; it may not be used to satisfy a Second-Level requirement. Analysis of operational situations and policy issues. Developing and implementing solutions to managerial problems. Prerequisite: advanced master's degree standing and completion of at least eight Second-Level MBA courses. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) Staff

Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) Staff

Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff

(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood

An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

331 **Seminar: Financial Markets** (3) Amling, Handorf, Sach
Research seminar in corporate financial theory, investment portfo theory, and capital market theory. (May be repeated once for credi Prerequisite: BAd 232, 234, 238.

341 **Seminar: Marketing** (3) El-Ansary, Dy
Examination of major theoretical developments in marketing. Topi include advances in research methods, models and data analys Emphasis on emerging concepts in consumer behavior, channe marketing communication and marketing information systems.

358 **Colloquium on International Business** (3) Grub, Keegan, Zwi
Examination of selected topics in international business, with a phasis on major new theoretical and empirical developments. (Fa

359 **Colloquium on Comparative Management** (3) Ste
Comparative analysis of management systems under different ec nomic, social, and political conditions. Generic characteristics management and how modified in different environments. Examin tion of selected literature. (Spring)

365 **Seminar: Applied Economics** (3) Blac
Special topics and applications of analytical tools to business d cision-making and policy. Prerequisite: BAd 261, 262; or permissio of instructor.

381 **Seminar: Materials and Operations Management** (3) Sta
Recent developments in manufacturing production and materia management; impact of technological, economic and social-chang significant related trends. Private and public sector policy implic tions. New and emerging analysis techniques. Prerequisite: BAd 27 280, or equivalent; or permission of instructor.

391 **Seminar: Business Management** Burdetsky, Easti
Examination of major current issues, both theoretical and empirica affecting the development of the business enterprise. Topics to b announced. Emphasis on policy and strategic issues affecting th total enterprise.

398 **Advanced Reading and Research** (arr.) Chitwoo
Limited to students preparing for the Doctor of Business Administra tion general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) Chitwoo
Limited to Doctor of Business Administration candidates. May b repeated for credit.

CHEMISTRY

Professors R.E. Wood *(Chairman)*, T.P. Perros, W.E. Schmidt, D.G. White J.B. Levy, N. Filipescu, A.D. Britt, E.A. Caress
Associate Professors D.A. Rowley, M. King, D. Ramaker

Bachelor of Arts or Bachelor of Science with a major in chemistry (depart mental)—**The department offers two undergraduate majors designed to giv**

students broad training in the basic divisions of chemistry: analytical, inorganic, organic, and physical. *Major I* provides considerable concentration in chemistry. However, it permits a wider selection of electives and thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. *Major II* is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. Two foreign languages are recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for Major I and Major II—Chem 11–12 and 22, or 15–16; Math 30, 31; Phys 1, 2.

3. (a) Required courses for Major I—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 134, 141, 151–52, 153–54.

(b) Required courses for Major II—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 141–42, 151–52, 153–54, 235; Math 32; one course selected from Chem 195, 207, 213, 221, 222, 251; Math 111, 139; Phys 161, 165, 175; Stat 197.

Twelve semester hours in French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish (students in Major II should elect German) are recommended for students in both Major I and Major II.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry as evaluated by the faculty.

Minor in Chemistry—Required: Chem 11–12, 22, 50, and 111; Chem 151, 152, 153, or 154 may be substituted for Chem 50.

Master of Science in the field of chemistry—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. The required 30 semester hours of graduate work must include Chem 213 and 221, and at least two of the following: Chem 207, 236, and 251. The thesis requirement. Chem 299–300, may be in analytical, inorganic, organic, or physical chemistry. Chem 156, or its equivalent, is prerequisite to research work in the field of organic chemistry. A reading knowledge examination in German or Russian must be passed, or proficiency in computer programming must be demonstrated. A student who intends to become a doctoral candidate is strongly urged to take Chem 207 as early as possible in the master's program.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Prerequisite: a bachelor's degree with a major in chemistry or in geology from this University, or an equivalent degree.

Required: the general requirements, pages 91–99, including Chem 111–12, 213, and 299–300, and Geol 141, 241, and 249. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Department of Chemistry or Geology must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Doctor of Philosophy in the field of chemistry—Required: the general requir ments, pages 91–93, 99–101. Chem 207, 213, 221, 235, 251, and 350 are normal required of the doctoral student, in addition to other courses as determined b consultation with the departmental program committee. A reading knowledg examination in German or Russian must be passed, *and* proficiency in com puter programming must be demonstrated. Cumulative examinations replac the General Examination requirement.

Research fields: analytical chemistry, inorganic chemistry, organic chemistr physical chemistry (electrochemistry, kinetics, magnetic resonance, theoretical physical organic chemistry (reaction mechanisms), and structure and synthes of natural products.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Re search (Chem 399) in the form of course work jointly approved by the Chemistr Department and the Graduate Program in Science, Technology, and Publi Policy. The purpose of this option is to provide a useful background for chemis try doctoral students who may be employed in government agencies dealin with science, technology, and public policy programs. The 12 hours may b selected from the following courses: PSc 222, 223, 252, 203, 217; PAd 214, 260 Mgt 233, 234.

Doctor of Philosophy in the field of geochemistry (an interdepartmenta degree offered by the Departments of Chemistry and Geology)—Required: th general requirements, pages 91–93, 99–101, including a reading knowledg examination in an approved foreign language plus the satisfactory completio of Stat 117 and 118, or 91; and the satisfactory completion of the Genera Examinations in four fields, including chemistry and geochemistry.

Bachelor of Arts in Education and Human Development with a teaching field in chemistry—Prerequisite: the education curriculum, page 114.

Required: the chemistry option and professional courses on page 117.

Graduate Placement Examinations: All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the depart ment of chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical organic, inorganic, and physical chemistry) are of the multiple-choice type These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's back ground.

Registration: Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation and laboratory sections. The work of the junior and senior years must be approved by the department.

All graduate students are required to participate in the seminar and col loquium programs.

PHYSICAL SCIENCE

First Group

3–4 **Contemporary Science for Nonscience Majors** (3–3) Filipescu

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physi

cal, biological and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester. (Academic year)

CHEMISTRY

First Group

11–12 General Chemistry (4–4) — Perros

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester. (Chem 11 and 12—fall and spring)

13 General Chemistry (4) — Britt

For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $28. (Fall)

15–16 Intensive General and Analytical Chemistry (4–4) — Britt

(Honors Course)

Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour). Equivalent to Chem 11–12 and 22, but with selected topics studied in depth. Prerequisite to Chem 15: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $28 per semester. (Academic year)

22 Introductory Quantitative Analysis (4) — Schmidt

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

50 Introduction to Organic Chemistry (4) — Caress

Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Prerequisite: Chem 12 or 16. Laboratory fee, $28. (Spring)

Second Group

110 Introduction to Physical Chemistry (3) — Wood

Topics include chemical thermodynamics, chemical kinetics, electrochemistry, solution chemistry, membrane and phase equilibria, and others. Prerequisite: Chem 16 or 22, Math 31, Phys 2; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111–12 or an equivalent course. (Summer)

111–12 Physical Chemistry (3–3) Wood, Ramake

Gas laws, chemical thermodynamics, chemical equilibrium, kinetic quantum chemistry, atomic and molecular spectra, structure of solid liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 o 22; Math 31; Phys 2. Prerequisite to Chem 112: Chem 111. (Aca demic year)

113 Physical Chemistry Laboratory (2) Ramaker, Schmidt, Woo

Laboratory complement to Chem 111. Prerequisite or concurren registration: Chem 111. Laboratory fee, $28. (Fall)

114 Instrumental Analysis Laboratory (2) Schmidt, Ramake

Laboratory complement to Chem 112 and 122. Prerequisite or con current registration: Chem 112, 113, and 122. Laboratory fee, $28 (Spring)

122 Instrumental Analysis (3) Schmid

Theory of instrumental methods in qualitative and quantitativ analysis, determination of structure, and study of reaction mechan isms with emphasis on electroanalysis, spectrophotometry, and chromatography. Correlated with Chem 114. Prerequisite or concur rent registration: Chem 112. (Spring)

134 Descriptive Inorganic Chemistry (2) Perros

Intermediate-level course emphasizing the descriptive chemistry o the elements. Prerequisite: Chem 16 or 22, 152. Prerequisite or con current registration: Chem 111. (Fall)

141–42 Advanced Experimental Chemistry (2–2) White, Caress

Designed to provide the chemistry major with facility in experimen tal methods common to all disciplines of chemistry. Prerequisite Chem 154. Prerequisite or concurrent registration: Chem 111. Labora tory fee, $28 a semester. (Academic year)

151–52 Organic Chemistry (3–3) Levy, King

Chemistry of the compounds of carbon. Prerequisite to Chem 151 Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 Organic Chemistry Laboratory (1–1) Staff

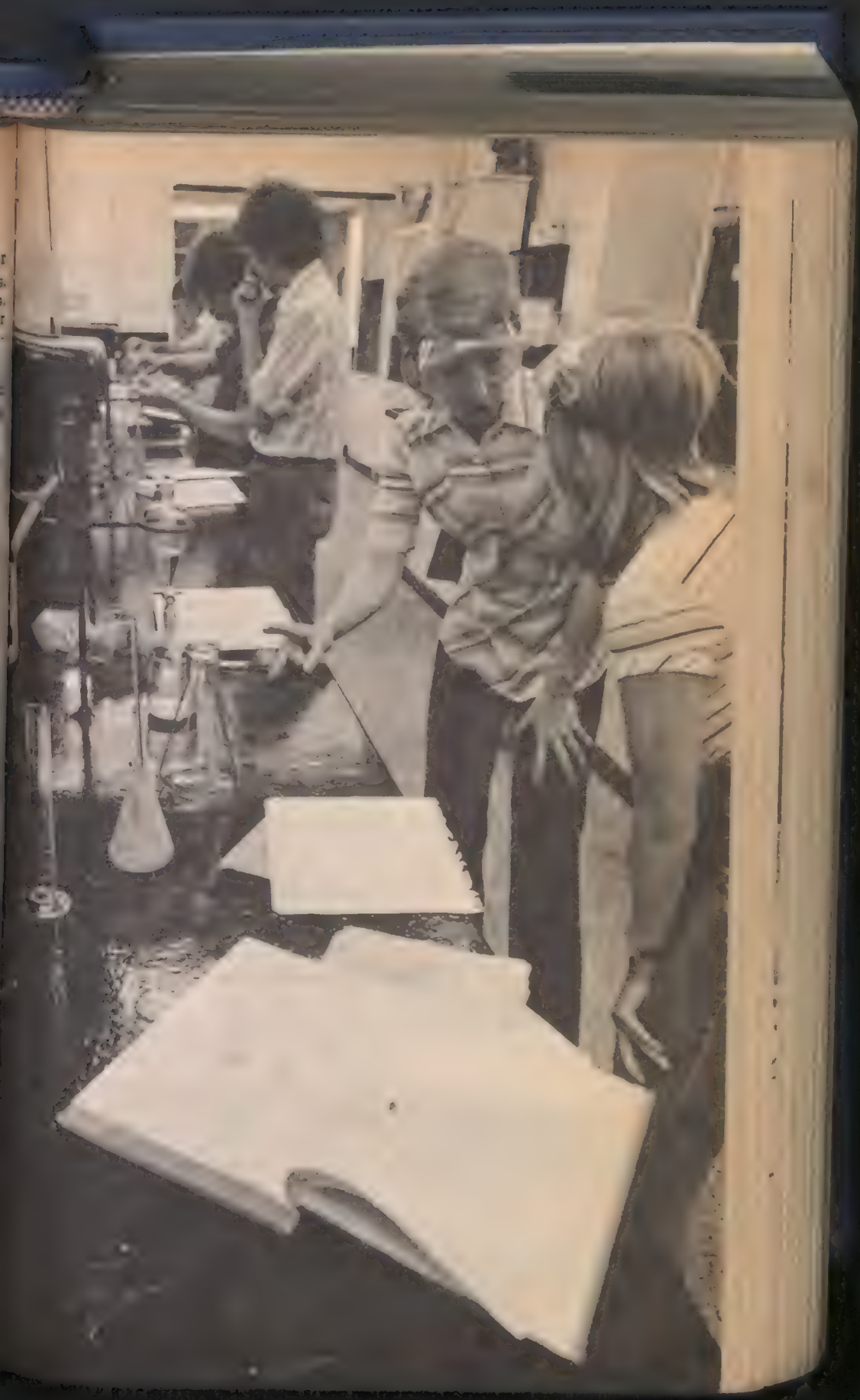
Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. (Academic year)

156 Qualitative Organic Analysis (3) King

Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and/or others as appropriate; identification of their compo nents using spectroscopic techniques. Lecture emphasizes the prac tical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22, 154. Laboratory fee, $28. (Spring even years)

191 History of Chemistry (2) Perros

Historical development of chemistry from antiquity to the 20th cen tury. Prerequisite: Chem 12 or 16. (Fall, odd years)



195 Undergraduate Research (1 or 2) — Staff

Research on problems approved by the staff. Approval must be obtained prior to registration. May be repeated once for credit. Laboratory fee, $14 per semester hour. (Fall and spring)

Third Group

207 Chemical Bonding (3) — Ramaker

Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. (Fall)

211–12 Physical Chemistry (2–1) — Wood, Ramaker

Same as Chem 111–12. Admission only by departmental permission. Credit assigned upon satisfactory completion of Chem 213. (Academic year)

213 Chemical Thermodynamics (3) — Wood

Application of thermodynamics to chemical problems. Thermochemistry, homogeneous and heterogeneous equilibria, statistical calculation of thermodynamic properties, electrochemistry. Prerequisite: Chem 112 or 212. (Spring)

216 Statistical Mechanics (3) — Ramaker

Introduction to classical and quantum statistics designed to acquaint students with basic principles and methods. Prerequisite or concurrent registration: Chem 207 or permission of instructor. (Offered as the demand requires)

218 Molecular Spectroscopy (3) — Ramaker

Applications of quantum chemistry, molecular orbital theory, valence bond theory, vibration and rotation of molecules, IR and electronic spectroscopy. Prerequisite: Chem 207. (Spring, odd years)

221 Advanced Analytical Chemistry I (3) — Britt

Theory and application of recent spectrometric methods of analysis, including electrical, magnetic, and optical instrumentation. Prerequisite: Chem 122. (Fall)

222 Advanced Analytical Chemistry II (2 or 3) — Schmidt

Lecture (2 hours), laboratory (3 hours—optional). Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. Laboratory fee, $14. (Spring, even years)

233 Organometallic Chemistry (3) — White

Survey of organometallic compounds with emphasis on the compounds of lithium, boron, aluminum, silicon, the transition metals, and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)

235–36 Advanced Inorganic Chemistry (3–3) — Rowley

Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)

251–52 Advanced Organic Chemistry (3–3) Filipesc

Synthesis, reactions, and properties of organic compounds; fund mental theories of organic chemistry, emphasis on reaction mecha isms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Che 252: Chem 251. (Academic year)

257 Physical-Organic Chemistry (3) Lev

The transition state theory of chemical kinetics, applications to re action mechanisms; kinetic isotope effects, linear-free energy rela tionships, concentrated and "super" acids, Woodward-Hoffman rule free radical reactions. Prerequisite: Chem 252 or permission of in structor. (Fall, odd years)

258 Synthesis and Structure Determination in Organic Chemistry (3) Cares

Methods of structure determination and synthesis of complex organic molecules. Prerequisite: Chem 251 or permission of instructor (Fall, even years)

259 Polymer Chemistry (3) Barkin

A study of the preparation, properties, and structure of macromole cules. Prerequisite: Chemistry 152 and 111 or permission of in structor. (Fall)

295 Research (arr.) Staff

Research on problems approved by the staff. Open to qualified stu dents with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $14 a semester hour. (Fall and spring)

299–300 Thesis Research (3–3) Staff

(Fall and spring)

Fourth Group

350 Choice and Design of a Research Problem (1) Staff

Development in written form of an original research plan, fully refer enced, and its oral defense. If a grade of C is received, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)

398 Advanced Reading and Research (arr.) Staff

Limited to students preparing for the Doctor of Philosophy cumula tive examinations. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

CHINESE

See **East Asian Languages and Literatures.**

CLASSICS

Associate Professor J.E. Ziolkowski *(Chairman)*
Associate Professorial Lecturer M.E. Norton
Assistant Professor E.A. Fisher
Assistant Professorial Lecturer Y.M. Moses
Special Lecturer M.D. Ticktin

Bachelor of Arts with a major in classical humanities (departmental)—The following requirements must be fulfilled:

The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses—Clas 1–2, 3, 4; or equivalent; or Clas 11–12, 13–14; or equivalent; and Clas 71, 72. Students may substitute for Clas 3, 4, or 13–14 two additional courses (6 semester hours) consisting of Clas 64 and a course to be selected in consultation with the departmental advisor.

3. Required courses in the major—(a) 12 semester hours selected from second-group classics courses; (b) 18 semester hours selected from Art 101, 102, 103, 111; Hist 105, 107, 108, 109, 110, 111; Phil 111; PSc 105; Rel 143.

Bachelor of Arts with a major in classical archeology and classics (departmental)—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)

2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.

3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 15 semester hours in second-group courses in Greek or Latin, including Clas 138. (A reading knowledge of French and German is recommended.)

Minor in classical humanities—(a) 6 semester hours selected from Clas 1–2 or 11–12; (b) 9 semester hours selected from Clas 3, 4, 13, 14, 71, 72, 105, 108, 113, 127, 170, 185, 186; (c) 6 semester hours selected from Art 101, 102, 103, 111; Hist 107, 108, 109, 110.

Master of Arts in the field of classical archeology, classics, and history (an interdepartmental degree program offered by the Departments of Art, Classics, and History)—Prerequisite: a bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99. The program of study consists of 24 semester hours of course work (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the departments of art, classics and history; plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

COURSES IN GREEK, HEBREW, LATIN, AND YIDDISH

First Group

1–2 Beginning Latin (3–3) Ziolkowski

Grammatical essentials of the language, appropriate reading selec-

tions, development of English derivatives, introduction to Roman lif and literature. (Academic year)

3 **Intermediate Latin: Prose and Poetry** (3) Norto
Development of ability to read and understand Latin literature o moderate difficulty. Prerequisite: Clas 1–2 or equivalent. (Fall)

4 **Vergil's Aeneid** (3) Norto
Significant passages of Vergil's famous epic—in Latin; reading an discussion of the entire poem in translation. Prerequisite: Clas 3 o permission of instructor. (Spring)

11–12 **Beginning Greek: Classical** (3–3) Fishe
Study of the grammar, vocabulary, and structure of Greek. Readin of selected ancient authors. (Academic year)

13–14 **Intermediate Greek: Classical** (3–3) Staf
Review of grammar; extensive reading of prose and poetry: e.g. Homer, Herodotus, or a play. (Academic year)

21–22 **Beginning Hebrew** (3–3) Moses
Grammatical essentials of the language; readings selected from clas sical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 per semester. (Academic year)

23–24 **Intermediate Hebrew** (3–3) Ticktin
Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. (Academic year)

25–26 **Yiddish for Reading and Conversation** (3–3) Ticktin
Grammatical essentials of the language, appropriate reading selec tions, conversational exercises for beginners. (Academic year)

Second Group

103 **Modern Hebrew Nonfiction** (3) Ticktin
Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. (Fall)

104 **Modern Hebrew Fiction** (3) Ticktin
Study of selected modern Israeli short stories and poems. (Spring)

109–10 **Major Latin Authors** (3–3) Ziolkowski
Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3–4 or permission of instructor. (Academic year)

134 **Medieval Latin** (3) Andrews
Selections from the Vulgate and representative Latin writers through the 11th century. Prerequisite: Clas 3, 4; or permission of instructor. May be taken for graduate credit with approval of instructor. (Spring)

139–40 **Major Greek Authors** (3–3) Staff
Selections from a wide variety of Greek prose, drama, and poetry.

suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff
Reading of material in the student's field of interest. Admission by permission of instructor. May be taken for graduate credit.

Third Group

201 **Greek Epigraphy** (3) Staff
Readings in Greek epigraphical texts. May be repeated for credit with permission of instructor. Prerequisite: at least two years of college Greek. (Fall)

COURSES IN ENGLISH TRANSLATION

First Group

64 **Greek and Latin Origins of English Words** (3) Fisher
Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc.

71 **Greek Civilization** (3) Fisher
Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Civilization** (3) Ziolkowski
Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

100 **Modern Hebrew Literary Classics** (3) Ticktin
Prose and poetry of a century of writing from the beginning of the Hebrew literary renaissance to contemporary Israeli literature, including works of Bialik, Agnon, Peretz, Hazaz, Amichai, and Oz.

Second Group

101 **Israeli Society and Culture: Literary Perspectives** (3) Ticktin
A study of literature reflecting such contemporary issues as the conflict between the "builders' generation" and their children; the cultural contacts of Ashkenazim and Sefardim; image of the Arab; impact of the Holocaust; Zionist ideals and current realities. (Fall)

102 **Contemporary Israeli Short Stories and Poetry** (3) Ticktin
An introduction to post-1948 writers, including A. B. Yehoshua, Amos Oz, David Shahar, Aharon Apfelfeld, Dahlia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana-Karmon. (Spring)

105 **Special Topics in Classical Literature** (3) Staff
Focus on a selected topic, such as death in classical antiquity or the hero, or on study of a genre, such as satire or oratory. May be repeated for credit.

108 Classical Mythology (3) Norto

Mythology of the Greeks and Romans from the creation of th world: tales of the gods, heroes, and great families that have infl enced literature, art, and music. (Fall)

113 Greek and Roman Drama (3) Sta

Selected masterpieces of Greek and Roman tragedy and comed (Spring)

127 Classical Influence on Western Civilization (3) Ziolkowsk

A survey of Greek and Roman influence on Western civilizatio relevant to modern America: literature, art, law, science, philosophy etc. (Fall)

138 Seminar: Classical Studies (3) Staf

Survey of the broad range of sources and resources involved i pursuing classical studies: standard references, periodicals, librar holdings, papyrology, textual criticism, history of classical scholarshi

170 Women in Classical Antiquity (3) Norton

In-depth study and discussion of readings from ancient and moder sources on the role of women in Greek and Roman society.

CRIMINAL JUSTICE

See **Forensic Sciences.**

DRAMA

See **Speech and Drama.**

EARLY MODERN EUROPEAN STUDIES

Committee on Early Modern European Studies

R.E. Kennedy *(Chairman)*, F.S. Grubar, C.A. Linden, G.E. Mazzeo, J.P. Reesing, Jr., R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed to enhance the student's understanding of the history, philosophy, religion, sciences, literature, and arts of the five centuries (1300-1800) during which the Western World began to take on its modern dimensions. The program is directed by an interdepartmental committee.

Bachelor of Arts with a major in Early Modern European Studies—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Requirements for the major:
   a. Six semester hours of third year level French, German, or Spanish literature courses taught in the language, from among the following:

Fren 120, 121–22, 123–24; Ger 103–4, 111–12, 131–32; Span 121–22, 123–24, 125

b. Phil 112
c. Rel 145
d. PSc 106
e. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following: Art 104–5, 106–7, 108, 113–14, 121–22; Engl 125–26, 127–28, 129, 130, 131–32; Hist 101, 105, 121–22, 123, 141, 148, 151, 153, 154

EAST ASIAN LANGUAGES AND LITERATURES

Professor C.W. Shih
Associate Professorial Lecturers T. Lawton, M.J. Evans
Assistant Professors G.C.Y. Wang, D.L. Lee *(Chairman)*, J. Chaves *(Visiting)*
Lecturer M. Wang

Bachelor of Arts with a major in Chinese Language and Literature—The requirements are as follows:

1. The general requirements as stated on pages 74, 78–79, and 171. (Sixty semester hours from Columbian College, or the equivalent from another accredited institution are required.)
2. Prerequisite courses—Chin 5–6 (preferred); or Chin 1–2, 3–4, and 9; or Chin 7–8 and 9.
3. Required for the major:

(a) *Departmental major in the School of Public and International Affairs*—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

(b) *Field-of-Study major in Columbian College of Arts and Sciences*—Completion of Chin 11–12, 109–10, 163–64, and the passing of the major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Bachelor of Arts with a major in East Asian Studies (China or Japan)—See pages 74, 79, and 171.

A Junior Year Abroad Program is available.

Master of Arts in East Asian Studies with a concentration in Chinese Language and Literature. The requirements are as follows:

1. The general requirements as stated on pages 173–78.
2. Prerequisite: 24 semester hours of Chinese language.
3. 12 semester hours of Chinese literature, 6 hours of history, and 6 hours of relevant East Asian courses.
4. 6 semester hours of thesis research.

CHINESE

First Group

***1–2 Beginning Mandarin Chinese, Level I** (3–3) Staff

Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester. (Academic year)

***3–4 Beginning Mandarin Chinese, Level II** (3–3) G. Wang

Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 Beginning Intensive Mandarin Chinese, Levels I-II (8–8) Lee

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 6: Chin 5. Laboratory fee, $17.50 per semester. (Academic year)

***7–8 Beginning Intensive Mandarin Chinese** (6–6) Lee, Wang

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 8: Chin 7. Laboratory fee, $17.50 per session. (Summer)

***9 Beginning Mandarin Chinese, Level II** (4) Lee

Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $17.50. (Fall or spring)

10 Chinese Calligraphy (1) M. Wang

Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring)

11–12 Intermediate Intensive Mandarin Chinese (6–6) G. Wang

Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6 or 9. Prerequisite to Chin 12: Chin 11. Laboratory fee, $17.50 per semester. (Academic year)

13–14 Reading Chinese for Beginners (4–4) Staff

Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language. (Academic year)

22 Intermediate Chinese Conversation (2)

A practical course for improving speaking ability. Prerequisite: 6 credit hours of Chinese or equivalent. May be repeated for credit.

* The combination of Chin 1-2, 3-4, and 9, or the combination of Chin 7-8 and 9, is equivalent to Chin 4.

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia. (Spring)

93–94 **East Asian Literature—in Translation** (3–3) Staff

Lecture and discussion. Survey of Chinese and Japanese literature, from earliest periods through literary masterpieces of the early 20th century. (Academic year)

Second Group

107–8 **Readings in Modern Chinese** (3–3) Staff

Intensive readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

109–10 **Introduction to Classical Chinese** (3–3) Shih

Introduction to classical writing in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Alternate academic years)

123–24 **Introduction to Chinese Linguistics** (3–3) Lee

Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Academic year)

161–62 **Introduction to Chinese Culture** (3–3) Staff

Survey of the Chinese cultural heritage—literature, philosophy, art, religion, and social history—from pre-history to the modern era. Lecture and discussion in English. (Academic year)

163–64 **Chinese Literature in Translation** (3–3) Evans

An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year)

179–80 **20th-Century Chinese Literature** (3–3) Shih

Short stories of Lu Hsün, Lao She, and others. Informal essays by Lu Hsün, Chou Tso-jen, and Chu Tzu-ch'ing. Drama of T'ien Han and Ts'ao Yü. Prerequisite: Chin 107 or equivalent. (Academic year)

185–86 **Directed Reading** (3–3) Staff

Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) Staff

Conferences and group discussions. (Academic year)

* An interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

Third Group

271–72 **Poetry of the T'ang and Sung Periods** (3–3) Sta
Reading of works of leading poets. Discussion of content and styl
Prerequisite: Chin 109 or equivalent. (Alternate academic year

273 **Yüan Drama** (3) Shi
Readings of plays by Kuan Han-ch'ing, Ma Chih-Yüan, Cheng Kuang
tsu, Po P'u, and Wang Shih-fu. Prerequisite: Chin 109 or equivalen

277–78 **Prose Narratives of the Sung, Ming, and Ch'ing Periods** (3–3) Shi
Short stories of the Sung period. Selected readings of Ming-Ch'in
novels. Historical development and stylistic traits. Prerequisite: Chi
107 or equivalent. (Academic year)

JAPANESE

First Group

1–2 **Beginning Japanese, Level I** (4–4) Staff
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and
pronunciation with graded reading and practice in writing. Prerequi-
site to Japn 2: Japn 1. Laboratory fee, $17.50 per semester. (Aca-
demic year)

3–4 **Beginning Japanese, Level II** (4–4) Staff
Lecture (4 hours), laboratory (1 hour). Continuation of grammar with
more emphasis on written language and reading. Prerequisite to Japn
3: Japn 2. Prerequisite to Japn 4: Japn 3. Laboratory fee, $17.50 per
semester. (Academic year)

ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr. *(Chairman)*, J. Aschheim, R.P
Sharkey, H. Solomon, S. Levitan, T. Suranyi-Unger, Jr. *(Research)*, C.Y
Hsieh, J.L. Gastwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.E
Haber, A. Adams *(Research)*, R.S. Goldfarb
Adjunct Professors T.F. Carroll, J. Grunwald, J.L. Fisher, P. Swamy,
J. Hardt
Professorial Lecturers E.M. Hadley, O.C. Snellingen, J. Kraft, T.D. Simpson
N.E. Terleckyj
Associate Professors R.Y. Yin, J.R. Barth, A.M. Yezer, O. Havrylyshyn,
R.M. Scheffler, J.J. Cordes, S. Neftci
Associate Professorial Lecturers P.A. Musgrove, S.C. Salop, D.G. Tuerck,
J.E. Fredland, T.R. Robinson, J. Salop, R.E. French, S.E. McGaughey,
A. Gelb
Assistant Professors R. Sines, A.D. Strickland, M.R. Metzger, V. Fon, H.S
Watson, S. Islam *(Visiting)*, M.L. Marlow
Assistant Professorial Lecturer J. Muskin

Bachelor of Arts with a major in economics (departmental)—The following
requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Prerequisite course—Econ 1–2.

3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; six semester hours of a social science other than economics.

4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

Minor in economics—a) 21 credit hours in economics courses, including Econ 1, 2, 101, 102, and three other 100-level courses in economics; b) 6 credit hours of an approved statistics sequence, such as Stat 111–112, or 6 hours selected from Math 31–32, 41–42, 51–52.

Master of Arts in the field of economics—Prerequisite: a Bachelor of Arts degree with a major in economics from this University, or an equivalent degree. An understanding of basic calculus is assumed for those entering the Master of Arts program in economics.

Required: the general requirements, pages 91–99, including (1) Econ 203–4, 205, and 275 or 279; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; (4) completion of a tool requirement (either the passing of a reading knowledge examination in one foreign language or the satisfactory completion of one of the following courses: Math 124, Stat 97, or Stat 157); and (5) either a thesis (Econ 299 300) or 12 semester hours selected from additional third-group economics courses.

Doctor of Philosophy in the field of economics—Required: the general requirements, pages 91–93, 99–101, including (1) Econ 202, 203–4, 205–6, 215–16, 379 or 380, and 24 additional semester hours of approved graduate course work including Econ 275 or 279; (2) passing of the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee; (3) completion of the tool requirement: the passing of a reading knowledge examination in one foreign language, plus the satisfactory completion of Math 124, Stat 197, or Stat 157 (a minimum of six semester hours in approved graduate course work, completed with a grade of *B* or above, in a department other than Economics, is permitted as a substitution for the language reading examination); and (4) a dissertation to demonstrate the candidate's ability to do original research in one of the following fields: econometrics development, economic history, economic policy, economic theory, environmental economics, health economics, history of economic thought, industrial organization, international economics, labor economics, mathematical economics, monetary ecoonomics, national income accounting, natural resources economics, public finance, regional and urban economics, and Soviet economics.

Departmental prerequisite: Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18.

First Group

1–2 Principles of Economics (3–3) Hsieh, Long, Dunn

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1:

macroeconomics; Econ 2: microeconomics. (Econ 1 and 2—fall a spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Facul
An interdisciplinary course, introducing the student to a compr hensive and integrated understanding of the civilization and prese problems of East Asia.

Second Group

101 **Intermediate Microeconomic Theory** (3) Yin, Metzger, Stricklan
Analysis of supply, demand, and pricing. (Fall and spring)

102 **Intermediate Macroeconomic Theory** (3) Kendrick, Yi
Theories of national income determination and growth. (Fall an spring)

104 **History of Economic Thought** (3) Hsieh
History of the major schools of economic thought, influence o changing problems on the development of economic theory (Spring)

105 **Economic Conditions Analysis and Forecasting** (3) Kendrick
Theory and empirical analyses of economic trends and fluctuations use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth, Marlow
Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system. (Fall and spring)

122 **Monetary Theory and Policy** (3) Aschheim, Barth
Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates and price level. Prob- lems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

123 **Introduction to Econometrics** (3) Sines
Joint offering of the Economics and Statistics Departments. Con- struction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to eco- nomic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 111. (Spring)

130 **Comparative Economic Systems** (3) Aschheim
Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Staff
Development and main features of economic life in the Soviet Union. (Fall)

134 **Comparative Communist Economic Systems** (3) Staff
Analysis of economic development and performance of the Soviet

* Interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, Political Science, and Religion Depart- ments.

Union and other Soviet-type economies. Institutional aspects and quantitative measures of performance. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer
Analysis of market mechanisms for allocating energy and natural resources; cases of market failure in the use of the environment; policies to improve resource allocation using market and regulatory strategies. (Spring)

141 **Women in the Labor Market** (3) Haber
Application of the theory of the household and investment in human capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Fall)

142 **Labor Economics** (3) Haber
Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice; wages, prices, and unemployment; poverty and income maintenance. (Spring)

147 **Economic History of Europe** (3) Sharkey
Joint offering of the Economics and History Departments. European economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 **Health Economics** (3) Scheffler
Analysis of the determination of prices, output, and productivity in the health services sector of the economy.

151 **Economic Development** (3) Havrylyshyn
Economic problems of underdeveloped nations, with emphasis on economic theories of development and empirical measurement of development problems.

153 **Poverty in America** (3) Yezer
Joint offering of the Economics and Sociology Departments. Exploration of social and economic causes of poverty in the United States and evaluation of present and proposed anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

157 **Urban and Regional Economics** (3) Yezer
Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 **Industrial Organization** (3) Long
Analysis of the structures and production, pricing, and related practices of industries with emphasis on their significance and on appropriate economic policies. (Spring)

159 **Government Regulation of the Economy** (3) Strickland
Economic analysis of the rationale for effectiveness of government regulation in the American economy. (Spring)

160 **Social and Economic Indicators** (3) Staff

161 Public Finance I (3) Cordes, Watso
Theoretical and institutional analysis of government expenditure taxation, and intergovernmental fiscal relations. (Fall)

162 Public Finance II (3) Cordes, Watso
Theoretical and institutional analysis of fiscal policy and del management. (Spring)

165 Economics of Human Resources (3) Stewa
Economic analysis of education and training, information and re search, and other contemporary problems. (Fall)

169 Introduction to the Economy of Communist China (3) Yi
Background, organization, and operation of the economy. Appraisa of performance and analysis of problems of development. (Fall)

170 Introduction to the Economy of Japan (3) Hadley
Analysis of the structure and growth of the Japanese economy. (Spring)

179–80 U.S. Economic History (3–3) Sharkey
Joint offering of the Economics and History Departments. Process of economic growth from Colonial times to the present. Development of various sectors in the economy and their interdependence. Econ 179: 1607-1865. Econ 180: 1865 to present. (Academic year)

181–82 International Economics (3–3) Dunn, Islam
Econ 181: international trade theory and international monetary theory. Econ 182: continuation of international monetary theory; economic development. (Academic year)

185 Economic History and Problems of Latin America (3) Staff
Analysis of present structures and problems of Latin American economies. (Spring)

198 Proseminar in Economics (3) Aschheim, Holman
Examination of major topics in economic theory and the application of theory and analysis to policy problems. Open only to economics majors in their senior year. (Fall and spring)

199 Independent Research in Economics (3) Staff
Under the personal direction of an instructor. Limited to economics majors with demonstrated capacity. Prior approval of instructor required. (Fall and spring)

Third Group

Third-group economics courses (except 217–18) are designed for graduate students in economics or for graduate students with prescribed prerequisites.

202 History of Economic Thought (3) Hsieh
Critical analysis and interpretation of the development of economic theory from Plato through the "Keynesian Revolution" and the "Monetarist Counter-revolution." (Fall and spring)

203–4 Microeconomic Theory (3–3) Goldfarb, Metzger, Fon
Econ 203: demand, production. Prerequisite: Econ 101 or equivalent. Econ 204: market structure, income distribution, intertemporal al-

location, welfare economics; other topics. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

205 Macroeconomic Theory I (3) — Barth, Neftci

Theories of income, employment and the price level; aggregate supply and demand; consumption, saving, investment and the multiplier; supply and demand for money; government's and central bank's role in the economy. (Fall and spring)

206 Macroeconomic Theory II (3) — Hsieh

Capital and growth theory. Discussion of Cambridge controversy in the theory of capital and one- and two-sector models of economic growth. Other selected advanced topics in macroeconomics. (Fall and spring)

207 Business Cycle Analysis (3) — Kendrick

Empirical analysis of American business cycles; evaluation of the methodology and findings of the National Bureau of Economic Research. (Spring)

208 National Income (3) — Kendrick

Theory and measurement of economic aggregates within an integrated national income accounts framework, including balance sheets and wealth statements. (Spring)

210 Economic Methodology (3) — Stewart

Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory. (Spring)

215–16 Mathematical Economics (3–3) — Sines

Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 Survey of Economics (3–3) — Holman

For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

223–24 Monetary Theory and Policy (3–3) — Aschheim, Barth

Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 Seminar: Agrarian Reform, Income Distribution, and Development (3) — Carroll

Equity and asset redistribution issues in poverty-oriented rural development, stressing new forms of economic peasant associations, based on recent experiences and strategies in the LDCs. (Fall)

234 Seminar: Rural and Regional Development Projects (3) — Carroll

Design and evaluation of rural-based investment projects, including rural-urban linkages, with case studies drawn from the experience of international agencies. (Spring)

235 Energy Resources and Policy (3) — Staff

Consideration of economic and related policy issues directed at energy problems. (Fall)

237 Economics of the Environment and Natural Resources (3) Holma

Analysis of public policy problems relating to the environment an natural resources development and management. (Spring)

241–42 Labor Economics (3–3) Goldfar

Theory of wages and employment, analysis of labor supply and de mand. Structural unemployment; occupational choice; labor marke discrimination. (Academic year)

243 Seminar: Manpower Policy (3) Levita

Developments leading to expansion of public investment in man power resources; evaluation of goals and operations of publicly supported programs. Open to undergraduates. (Fall)

244 Economics of Education (3) Adam

Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 Industrial Organization (3–3) Long, Strickland

Structure and performance of the American economy; emphasis on the economics of antitrust policy and the impact of government regu latory policies. (Academic year)

247 Seminar: Industrial Organization (3) Long

Selected topics in regulatory economics and in antitrust economics during alternate years. Prerequisite: Econ 101 or equivalent. (Spring)

248 Health Economics (3) Scheffler

Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency and allocation of health care services.

251 Economic Development Theories (3) Havrylyshyn

Basic theories of economic growth and development. Emphasis on theories inspired by the underdevelopment process. (Fall and spring)

252 Economic Development Planning (3) Havrylyshyn

Development planning techniques and practice at both the macro and micro levels. Macro-planning tools analyzed include input/output, multi-sector models, simulation, and linear programming. Micro-planning includes the use of cost-benefit techniques in project analysis. Prerequisite: Econ 251. (Spring)

253 Productivity Analysis (3) Kendrick

Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall)

254 Economics of Advertising and Information (3) Tuerck

Theory and empirical analyses of the role of advertising and informa tion in industry structure and performance. (Fall)

255 Economics of Technological Change (3) Stewart

Economic principles related to determining the proper federal role in influencing civilian-oriented technological change. (Fall)

257 **Regional Economics** (3) Yezer
Analysis of firm location, patterns of interregional or intermetropolitan production, urban and regional growth and patterns of development. (Fall)

258 **Urban Economics** (3) Yezer
Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)

259 **Income Distribution** (3) Stewart
Theoretical and empirical analysis of income distribution, including analysis of policies related to income inequality. (Spring)

261 **Welfare Economics** (3) Stewart
Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

263 **Theory of Public Finance I** (3) Cordes
Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures, stabilization, and intergovernmental fiscal relations. (Fall)

264 **Theory of Public Finance II** (3) Cordes
Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)

265 **Readings in International Taxation** (3) Snellingen
Examination of topics in economic theory and policy of international taxation: taxation of foreign currency and multinational corporations, tax evasion and tax havens, and tax systems for economic development. (Fall)

267 **Seminar: Soviet Economy** (3) Hardt
Development of the Soviet-type economy. Organization, policies, and problems: monetary, production, allocative, foreign trade, economic growth. Admission by permission of instructor. (Fall)

268 **Seminar: Economic Theory and Development in Communist Countries** (3) Hardt
Appraisal of the Soviet model for economic development in the communist world, especially in Eastern Europe and China. Admission by permission of instructor. (Spring)

269 **Economy of Communist China I** (3) Yin
Analysis of organization, operation, policies, and problems. Development of the economy under communism. (Fall)

270 **Economy of Communist China II** (3) Yin
Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

271 **Economy of Japan** (3) Hadley
Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

275 **Econometrics I: Introduction** (3) Neftci

Joint offering of the Economics and Statistics Departments. Single equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equation problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Some exposure to matrix algebra is suggested. (Fall)

276 **Econometrics II: Simultaneous Equation Models** (3) Neftci

Joint offering of the Economics and Statistics Departments. Economic models and simultaneous equation systems. Prerequisite: Econ 275 Recommended: a course in matrix theory. (Spring)

279 **Methods in Economic Statistics** (3) Gastwirth, Neftci

Joint offering of the Economics and Statistics Departments. Application of statistical methods of economics. Curve-fitting, regression analysis of variance, and chi-square techniques used to analyze economic data. Prerequisite: a one-year course in statistics. (Fall and spring)

281–82 **International Economics** (3–3) Dunn

Econ 281: theory of international trade and factor movements. Econ 282: international finance. (Academic year)

285–86 **Economic Development of Latin America** (3–3) Grunwald

Econ 285: development models, import substitution, and industrialization: underemployment, inequality, and policies for employment and income redistribution. Econ 286: theory and performance in trade, economic integration, planning for development; foreign aid, foreign investment, technology transfers. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff

Interdisciplinary seminar partially guided by a specialist within the methodology of his chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

290 **Principles of Demography** (3) Staff

Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) Staff

Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data (Spring)

298 **Reading and Research** (3)

Limited to Master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires.

305 **Seminar: Macroeconomics** (3) — Staff
Selected topics in macroeconomics. Prerequisite: Econ 205.

312 **Seminar: Price Theory** (3) — Staff
Discussion of topics of price theory from recent journal articles.

313 **Seminar: Economic Thought** (3) — Hsieh
Continuation of Econ 202. Principal trends in economic thought.

315 **Seminar: Topics in Mathematical Economics** (3) — Solomon
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16.

321 **Seminar: Monetary Theory** (3) — Aschheim
Recent developments in monetary theory.

341 **Seminar: Labor Economics** (3) — Staff
Current problems in theory and policy.

363 **Seminar: Public Finance** (3) — Staff
Selected topics of current interest.

378 **Seminar: Topics in Econometrics** (3) — Swamy
Joint offering of the Economics and Statistics Departments. A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

379–80 **Readings in Economic History** (3–3) — Sharkey
Joint offering of the Economics and History Departments. Econ 379: American economic history. Econ 380: modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) — Staff
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) — Staff
Topics selected from current significant policy problems.

398 **Advanced Reading and Research** (arr.) — Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

EDUCATION

Professors M.E. Coleman, R.E. Baker, M.N. Rashid, R. Tillman, A. Marinaccio, L.H. Elliott, L. Nadler, M. Brenner, J.G. Boswell *(Chairman)*, C.E. Vontress, R.J. Frankie, S. Kavruck *(Visiting)*, M. McIntyre, D.A. Moore, L. Winkler, D. Linkowski, F.J. Brown *(Visiting)*, E.P. Kulawiec, E.W. Kelly, Jr., S.R. Paratore
Professorial Lecturers W.W. Chase, A. Drexler, D. Iwamoto, A.C. Jensen
Associate Professors G.L. Horrworth, R.I. Peterson, G.D. Wiggs, G.W. Smith, J.W. Fleck, M. Burns, J.C. Heddesheimer, J.A. Greenberg
Adjunct Associate Professor J.D. Fife
Associate Professorial Lecturers T.R. Howie, R. E. McNelis
Assistant Professors J.R. Blank *(Research)*, R.A. Luke *(Visiting)*
Adjunct Assistant Professor J. Noel
Assistant Professorial Lecturers J.D. Gates, M.R. Phelps, W.N. Davis, D.G. Altscher, P. Callas
Instructors C.B. Stapp *(Research)*, A.H. Macomber *(Research)*
Lecturers C.S.J. Gage, M.F. Kelso, S.A.R. Hoth

Programs of study leading to the degrees of *Bachelor of Arts in Education and Human Development, Master of Arts in Education and Human Development, Master of Arts in Teaching, Education Specialist,* and *Doctor of Education* are offered by the School of Education and Human Development (see pages 103–34).

Second Group

Educ 136, 137, 138, 139, 140, 144, and 146 are special methods courses which are to be elected in the senior year by students in the secondary school curriculum after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104, 105 for elementary majors; Educ 131 for secondary majors.

100 **Special Workshop in Education and Human Development** (arr.) — Staff
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

101 **Career Choices in Education and Human Services** (3) — Horrworth, Burns
Introduction to the wide variety of careers available in education and human development services: early childhood through college, museum, rehabilitation, industry, publishing, community, recreation, tourism, and government settings. Visits to selected sites. (Fall and spring)

102 **Introduction to Human Development I** (3) — McIntyre
Lectures and weekly field experience. All aspects of development through preadolescence. Field experiences based on a wide variety of child-study techniques. (Fall and spring)

103 **Introduction to Human Development II** (3) — McIntyre
Lectures and fieldwork experiences. Development from adolescence on. Cultural, familial, and societal influences. (Fall and spring)

104 Psychology for Learning and Teaching (3) Horrworth

Principles, theory, nature, and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. (Fall and spring)

105 Society and the School (3) Boswell

Historical and social development of education, contemporary issues, cooperation of the school with other community agencies, functions of school personnel. (Fall and spring)

110 Elementary School Teaching of Reading (3) Horrworth

Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and 105 or teaching experience.

111 Elementary School Curriculum and Methods (15) Moore and Staff

Diagnostic reading, mainstreaming, mathematics, science, language arts, social studies, music, art, physical education. Pre-student teaching one and one-half days a week. Prerequisite: Educ 102, 103, 104, 105; and senior standing. (Fall)

112 Measurement and Evaluation (3) Staff

Basic evaluative measurement techniques: selection, administration and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis. (Fall and spring)

113 Elementary School Art (3) Staff

Lecture and laboratory (3 hours), field work—as arranged. For undergraduates in the elementary school curriculum. Materials and methods. Material fee, $5. (Spring)

118 Elementary Reading: Classroom Diagnosis and Instruction (3) Horrworth

Emphasis on diagnostic procedure aimed at individualizing and improving classroom instruction. Prerequisite: Educ 110 or equivalent. (Fall and spring)

121 International Experiences (1 to 6) Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

124 Communication Skills and Teaching Strategies (3) Brenner

Theory and practice in the development of professional relationships and communications: teacher-student, museum-school, group strategies. The interview.

125 Museums as Cultural and Educational Resources (3) Stapp

(Formerly Museums in Washington)

Use of the museum for knowledge and enjoyment; museum objects as primary sources; meetings in D.C.-area art, history, and science museums.

128 Children's Literature (3) McIntyre

Lecture (2 hours), field work (2 hours). Newer books for children and the children's classics, contribution of literature to child development. (Spring)

131 Secondary School Principles and Methods (3) Kulawiec

For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group-work to be arranged. Prerequisite: Educ 104 and 105. (Fall)

132 Student Teaching in Early Childhood Schools (6 to 9) McIntyre

For seniors. Admission by permission of instructor. Prerequisite Educ 111 or equivalent; Educ 150, 152, 153, 154. (Fall and spring)

133 Supervised Experience in Education and Human Development Services (3 to 6) Staff

Field work, internship, and instructional practice: (1) adult education and human resource development (Wiggs); (2) college student development experience (Burns); (3) higher education (Frankie); (4) museum education (Brenner); (5) counseling (Heddesheimer). Admission by permission of instructor. (Fall and spring)

134 Student Teaching in Secondary Schools (6 to 9) Kulawiec and Staff

For seniors. Admission by permission of instructor. Prerequisite: Educ 131. (Fall and spring)

135 Student Teaching in Elementary Schools (6 to 9) Moore and Staff

For seniors. Admission by permission of instructor. Prerequisite Educ 111 or equivalent. (Fall and spring)

136 Teaching English in Secondary Schools (3) McNelis

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in English. (Spring)

137 Teaching Speech (3) Staff

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in speech or permission of instructor. (Spring)

138 Teaching Social Studies in Secondary Schools (3) Boswell

Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 Teaching Art in Secondary Schools (3) Staff

Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of Art. Material fee, $5. (Spring)

140 Teaching Mathematics in Secondary Schools (3) Gates

Lecture (2 hours), field work (2 hours). Prerequisite: mathematics through calculus. (Spring)

144 Teaching Science in Secondary Schools (3) Kulawiec

Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 Teaching Foreign Languages (3) Kulawiec

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 Foundations of Early Childhood Education (3) McIntyre

Historical developments, philosophy, and objectives of nursery schools, kindergartens, and day care centers; exploration of con-

temporary programs and models with curriculum implications for schools in the U.S. and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) McIntyre

Writing, content, approaches, programs, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) McIntyre

Planning, reporting, records, teacher-child and teacher-family interaction, diagnosis and evaluation, working with paraprofessionals. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services and resources; physical facilities, play activities, curriculum materials, and methods for teaching the young child. Admission by permission of instructor. (Spring)

161 **Human Development** (3) Rashid

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

171–72 **Seminar: International Education** (3–3) Moore

Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized. (Fall and spring)

173 **Comparative Education** (3) Kulawiec

A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

176 **Group Theories and Techniques** (3 or 4) Burns

Group interaction in diads, reference groups, and complex organizations. Focus on theorists including Argyris, Bales, Berne, Lewin, and Sherif. One additional semester hour for techniques laboratory is optional. Prerequisite: permission of instructor. (Spring)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler

Same as HKLS 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to

supplier personnel. Special attention to designing the core of the conference, and related conference activities. (Fall)

187 **Introduction to Sign Language and Deafness** (3) Staff
Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as HKLS 187 and SpEd 187.

188 **Sign Language and Deafness** (3) Staff
A second course in conversational expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as HKLS 188 and SpEd 188.

193–94 **Research and Independent Study** (arr.) Staff
Individual research under guidance of a staff member. (Academic year)

Third Group

Departmental prerequisite: A degree from an accredited institution is prerequisite to all third-group courses in education. Adequate professional preparation is prerequisite to all third-group courses in education except for those courses limited to students in the M.A.T. degree program. Undergraduate students in their senior year may enroll in third-group courses with permission from the instructor.

200 **Special Workshop in Education and Human Development** (arr.)
Topics to be announced in *Schedule of Classes*. May be repeated for credit.

201–2 **International Education** (3–3) Moore
Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world-mindedness. Embassy resources utilized. (Summer)

203–4 **Comparative Education** (3–3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

205 **Foundations of Curriculum Development** (3) Horrworth
For experienced teachers. Curriculum research and design, issues and trends, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of current field-related problems. (Fall and spring)

207 **Curriculum Design: Procedures and Materials** Horrworth
Organization (3 to 6)
For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations. (Spring)

208 **Human Development** (3) Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

209 **Child Development** (3) — Rashid

Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development** (3) — Rashid

Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) — Paratore, Smith, and Staff

Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **History of Education** (3–3) — Boswell

Educ 213: Education as a major factor in the development of world civilization from the invention of writing to the industrial revolution. Educ 214: evolution of the American school system. (Alternate academic years)

217–18 **Philosophy of Education** (3–3) — Staff

Educ 217: to help students formulate a personal philosophy of education. Educ 218: social foundations of education—forces that shape policies and offerings of the school. (Alternate academic years)

219 **Elementary School Classroom Procedures** (3) — Baker

Current theories of teaching and learning and their application to teaching strategies of elementary school teachers. (Spring)

221 **International Experiences** (1 to 6) — Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

222 **Foundations of Reading Instruction—Early Childhood and Elementary School** (3) — Coleman

Brief historical and psychological background of reading instruction; study and discussion of widely used approaches, methods, and materials for teaching reading; collection and preparation of specific activities for teaching the various reading skills; demonstrations of classroom instructional techniques. (Fall)

223 **Foundations of Reading Instruction in Content Areas—Intermediate and Secondary School** (3) — Coleman

Brief historical and psychological overview; need for teaching reading on these levels; emphasis on basic diagnostic and instructional methods and techniques; teaching demonstrations of basic reading and study skills in content subjects; study of "readability" of content materials; research and application of formulas. (Fall)

224 **Diagnostic Teaching of Reading (K-6)** (3) — Coleman

Classroom diagnostic techniques for elementary teachers; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests as well as other measures of evaluation; study of materials; selecting and planning activities suitable for correction of specific problems; application of readability formulas. Prerequisite: at least one previous course in reading. (Spring)

226 **Reading in Secondary School** (3) Coleman
Extension of diagnostic and instructional techniques in Educ 223: construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study and evaluation of materials and teaching procedures; application of readability formulas; class demonstrations of teaching strategies. Admission by permission of instructor. (Spring)

227 **Basic Issues in Elementary Education** (3) Baker
Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Baker
Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education.

233 **Audiovisual Education** (3) Staff
Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audiovisual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7. (Spring)

234 **Organization for Personalized Learning in the Open Classroom** (3) Horrworth
Practical application of individualized instruction theories and methods through design, development, implementation, and revision of elementary and secondary level self-instructional packages.

235 **Analysis of Teaching** (3) Boswell
Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program. (Fall)

236 **Introduction to Education Technology** (3) Staff
Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3) Wiggs
Application of systems techniques to the development of instructional programs. A workshop design, using multi-media instruction. (Summer)

241 **Education of the Gifted** (3) Rashid
For classroom teachers. Nature and discovery of giftedness, provisions for the gifted in regular classes, experimental projects.

242 **The Teacher and School Administration** (3) Brown, Fleck
Role of federal, state, and local administrative units; school finance; legal controls; school plant; public support; improving teaching conditions. (Fall)

243 **Human Relations in Education and Management** (3) Marinaccio
Principles and practices in human relations between and among learner, teacher, other school personnel, parents, and community.

245 **School and Community** (3) Marinaccio
The school as an important member of a team of social agencies that builds the community.

246 **Administrative Issues in Urban Education** (3) Staff
Investigation of current issues in urban education. (Fall and spring)

247 **Post-Secondary Career Education** (3) Greenberg
Development, current concepts, agencies involved, problems, and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college. (Spring)

248 **The Teacher and School Supervision** (3) Tillman, Brenner
Nature, organization, human relationships, and techniques. (Fall)

249 **Drug Treatment and Resources** (3) Staff
Individual, social, and cultural factors related to drug abuse. Rehabilitative methods in treating drug abusers; use of community resources. (Spring)

250 **Counseling Drug Abusers** (3) Staff
Counseling theory and practice applied to drug abusers. Crisis intervention, self-help groups, and family therapy; individual and group counseling. (Fall)

251 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

252 **Organization and Administration of Counseling Services** (3) Vontress
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

253 **Individual Appraisal in Counseling** (3) Winkler
Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent. (Fall and spring)

254 **The Middle School** (3) Kulawiec
Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

255–56 **Secondary Education** (3–3) Kulawiec
Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices. (Academic year)

257 **Career Development and Information** (3) Sinick, Vontress
Theories of career development; factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information. (Fall and spring)

258 **Theories and Techniques of Counseling** (3) — Heddesheimer, Vontress

Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling, including Educ 253 and 257. (Fall and spring)

259 **Administration of the Elementary and Secondary School** (3) — Fleck

For experienced teachers and administrators. Survey of administration, including practices of modern schools. (Fall)

260 **Supervision in the Elementary and Secondary School** (3) — Fleck, Brenner

For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. (Spring)

261 **Practicum in Counseling and Human Development** (3) — Staff

Intensive counseling experience under supervision. Emphasis on relationship dynamics, analysis, recommendations and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258. (Fall and spring)

262 **Internship in Counseling and Human Development** (3) — Staff

Counseling experience under University and institutional supervision in a variety of settings. Separate sections offered for counseling majors and human development majors. Admission by permission of instructor. (Spring)

263 **Human Resource Development: Training and Education** (3) — Wiggs, Nadler, Luke

Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall)

264 **Design of Training Programs in Human Resource Development** (3) — Nadler, Luke

Training, education, and development programs for various client systems will be planned using critical events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor. (Spring)

265 **Futurism and Education** (3) — Kulawiec

Contemporary view of the future through readings, discussion, simulation, games, and films. Impact of technology on humans and the environment. Future shock, alternative futures, overchoice. (Summer)

268 **Family Counseling** (3) — Winkler

The family as a system: how it affects the client and how the client affects it. Didactic presentations, role-playing, and work with simulated families. (Spring)

269–70 **School Business Management** (3–3) — Fleck

Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management. (Academic year)

273 **Pre-Service Teacher Education** (3) Boswell
Program development, governance, issues, trends. (Fall, alternate years)

274 **In-Service Teacher Education** (3) Boswell
Continuing professional development of educators, costs and benefits to society, promising programs and practices, current issues. (Spring, alternate years)

275 **School Finance** (3) Brown
Educational financial theory, practice, and control, including methods of financing. (Fall)

276 **Public Relations in School Administration** (3) Brown
Purposes, gathering and developing materials, disseminating agencies, publicity media, public participation in policy-making. (Spring)

277 **Dynamics of Change in Education** (3) Boswell
An analysis of the process of cultural change in Western society, with emphasis on education. Comparison of theories; analytical tools; historical precedents; the contemporary situation, prospects for the future.

278 **School Law** (3) Fleck
Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group. (Spring)

279 **Adult Education** (3) Nadler, Wiggs
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning in Adult Education** (3) Wiggs, Luke
Determining educational needs for adults in school and non-school agencies; designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

283 **Higher Education in the United States** (3) Frankie
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Marinaccio
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)

285 **Program Planning, Organization, and Coordination** (3) Burns
Focus on the skills and knowledge needed by student affairs professionals, faculty advisors, and college administrators in planning, budgeting, and dealing with policy issues related to campus programming. Includes program proposal preparation. (Spring)

287–88 **Clinical Study of Reading Problems** (3–3) Coleman, Peterson
For advanced students. Diagnostic and corrective work under supervision. Complete case study approach; selection and evaluation of

diagnostic and instructional materials and techniques for permanent file. Prerequisite: Educ 222 and 223, or 224 and 226. Material fee $10 per semester. (Academic year)

289 **Organization and Administration of Reading Programs** (3) — Peterson, Davis

For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program. (Fall and spring)

290 **Severe Learning Disabilities in Reading** (3) — Peterson

For experienced teachers. Case studies of children and/or adults with severe reading problems, planning and implementing instructional programs. Admission by permission of instructor. Material fee, $10. (Summer)

291 **Planning the School Plant** (3) — Chase

Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems. (Fall)

293–94 **Research and Independent Study** (3–3) — Staff

Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) — Paratore, Smith, Linkowski

Required of all candidates for masters' degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)

297 **Personnel Administration** (3) — Brown

Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions.

299–300 **Thesis Research** (3–3) — Staff

Required of M.A. in Ed. degree candidates writing master's theses. (Fall and spring)

302 **Quantitative Methods III: Inferential Techniques** (3) — Paratore, Smith

Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 **Data Analysis** (3) — Paratore

Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)

304 **Practicum in Supervision** (3 to 6) — Fleck, Tillman

Practical experience in supervision of instruction. Admission by permission of instructor.

305 **Internship: Supervision** (3 to 6) — Fleck

Service in a school situation directed by the University's faculty and school systems; integration of theory and practice.

306 **Quantitative Methods IV: Advanced Research Design** (3) — Paratore, Smith

Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

310 **Museum Studies** (3) — Stapp

Study of museums' functions and their educational roles. Admission by permission of instructor.

311 **Museum Audiences** (3) — Brenner

Study of the many audiences of many ages who use and enjoy museums; appropriate museum practices, proposal writing.

312 **Internship in Museum Education** (6) — Stapp

Full-time placement in education departments in area museums. Supervision and seminar are provided by George Washington University faculty. Admission by permission of instructor.

316 **Recent Developments in Elementary School Social Studies** (3 to 6) — Moore

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Recent Developments in Elementary School Science** (3 to 6) — Staff

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Recent Developments in Elementary School Mathematics** (3 to 6) — Staff

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor. (Spring)

321 **Practicum in Curriculum** (3 to 6) — Horrworth

Supervised field experience in curriculum. Admission by permission of instructor. (Fall and spring)

322 **Internship: Reading** (3 to 6) — Peterson

Limited to doctoral students in education. Experience in a selected area of college teaching. (Fall and spring)

323 **Internship: Reading** (3 to 6) — Peterson

Limited to doctoral students in education. Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) — Peterson

Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor. (Summer)

325 **Curriculum Theory** (3) Tillm

Examination of reviews and research studies in curriculum theo Focus on trends, values, interpretations, fads, design systems, a evaluation. (Spring)

330 **Foundations of Early Childhood Education** (3) McIntyr

Historical developments, philosophy and objectives of nurse schools, kindergartens and day care centers, exploration of co temporary programs and models with curriculum implications f schools in the United States and abroad. (Fall)

332 **Early Childhood Curriculum** (3) McIntyr

Writing content, approaches, programs, and materials in langua arts, mathematics, science, health, social studies, and aesthetic ed cation. (Fall)

333 **Role of the Professional in Early Childhood Education** (3) McIntyr

Planning, reporting, maintaining records, teacher-child and teache family interaction, diagnosis and evaluations, working with para professionals. (Spring)

334 **Community Resources and Materials for the Young Child** (3) McIntyr

Interaction with community agencies for services and resources physical facilities, play activities, curriculum materials, and method for teaching the young child. (Spring)

335 **Practicum in Early Childhood Education** (3 to 6) McIntyr

Supervised professional activity in selected early childhood pro grams; seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

336 **Practicum in Reading** (3) Coleman, Peterson, and Staff

Supervised experience in testing and teaching. Approximately 120 class hours required. Admission by permission of instructor. (Fal and spring)

341 **Cognitive Models and Instruction** (3) Rashid

Cognitive models (Guilford, Piaget, etc.) are analyzed as the theo retical basis for planning instructional episodes appropriate at vari ous levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid

Nature of language development; role of language in the socialization process. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid

Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation and research needs in respect to each topic discussed. Admission by permission of the instructor. (Spring)

353 **Counseling Older Persons** (3) Sinick

Special considerations and counseling emphases in regard to second careers, retirement adjustments, death and dying. (Spring)

354 **Cross-Cultural Counseling** (3) Vontress

Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States. (Fall and spring)

355 **Counseling in Groups** (3) Heddesheimer, Winkler

Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling. (Fall and spring)

356 **Counseling and the Disciplines** (3) Staff

For advanced students in counseling. Explores the psychological, sociological, economic, anthropological, and philosophical foundations of counseling. Admission by permission of instructor.

357 **Personal and Social Adjustment** (3) Winkler

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

358 **Advanced Theories of Counseling** (3) Vontress, Heddesheimer

Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

360 **Job Development and Placement** (3) Sinick

Policies, principles, and processes involved in job development, modification, placement, and post-placement services, with regard to disabled persons. Admission by permission of instructor. (Spring)

361 **Medical Aspects of Rehabilitation Counseling** (3) Sinick

Etiology, symptomatology, and treatment of chronic and traumatic disorders with rehabilitation counseling implications. Admission by permission of instructor. (Fall)

362 **Client Evaluation in Rehabilitation Counseling** (3) Blank

Test and non-test methods of furthering client and counselor understanding of vocational planning. Work sample assessment, interview, and observation. Prerequisite: Educ 212 or equivalent. (Spring)

363 **Psychosocial Aspects of Rehabilitation Counseling** (3) Linkowski, Blank

Impact of congenital and later disabilities on attitudes, self concepts, and motivations. Implications for client adjustments and counseling strategies. Admission by permission of instructor. (Fall)

364 **Administration of Two-Year Colleges** (3) Greenberg

A study of the community junior college, focusing on administrative patterns and national, regional, state, and local influences, as well as the theory and structure of two-year college organization. (Spring)

365–66 **Field Work in Rehabilitation Counseling** (3–3) Blank, Linkowski

Field work of one full day a week. Educ 365: concurrent seminar including history, philosophy, and introduction to practice. Educ 366: concurrent seminar including professional roles, caseload manage-

ment, agency functions, community resources, and counseling strat gies. Admission by permission of instructor. (Academic year)

367–68 **Internship: Rehabilitation Counseling** (6–6) Blan
Supervised practice of three full days a week, with seminar providin integration of theory and practice. Prerequisite: Educ 365–6 (Academic year)

369 **Professional Issues in Rehabilitation Counseling** (3) Linkowski and Sta
Culminating seminar covering professional problems and ethical i sues. Prerequisite: Educ 367. (Spring)

370 **College Students and Their Community** (3) Burn
Survey of literature on the characteristics, behavior, and attitudes o the contemporary college student; college students' interaction wit their environment. Admission by permission of instructor. (Fall)

371 **Principles and Practices in College Teaching** (3) Greenber
General principles, methods, techniques and experimental instruc tional media for teaching at the college and university level. (Fall

372 **Internship in College Teaching** (3 to 6) Greenber
Supervised experience in a selected area of college teaching. Pre requisite: Educ 371. Admission by permission of instructor (Spring)

373 **The Community-Junior College** (3) Greenber
The two-year college as it relates to secondary education, four-yea colleges, and universities. Objectives, curricula, students, faculty legal concerns, and special problems of two-year colleges. (Fal and spring)

374 **Current Issues in Higher Education** (3) Elliott, Marinaccio
Prerequisite: Educ 283, 284. (Spring)

375 **Foundations of College Student Development** (3) Burns
College student development as an integral part of higher education programs. (Fall)

376 **Group Theories and Techniques** (3 or 4) Burns
Group interaction in diads, reference groups and complex organiza tions. Focus on theorists including Argyris, Bales, Berne, Lewin, and Sherif. One additional semester hour for techniques laboratory is optional. Prerequisite: permission of instructor. (Spring)

377 **Practicum in College Student Development** (3 to 6) Burns
Supervised practical experience in college student development pro grams. Admission by permission of instructor. (Fall and spring)

378 **Practicum in Teacher Education** (3 to 6) Brenner, Boswell
For selected experienced teachers. Supervised field work relevant to students' professional needs, to be arranged. (Fall and spring)

379 **Practicum in Adult Learning Programs** (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of in structor. (Fall and spring)

380 **Sensitivity Training: Laboratory Method** (3) Staff

A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration. (Fall and spring)

381 **Adult Learning** (3) Wiggs, Luke

Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical and social environment in adult education situations. (Fall and spring)

382 **Instructional Strategies in Adult Learning Programs** (3) Nadler, Luke

Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)

383 **Interviewing-Counseling for Human Resource Developers** (3) Wiggs

Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings. (Fall)

384 **Evaluation of Adult Learning Programs** (3) Wiggs

Evaluation of adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)

385 **Collective Negotiations in Higher Education** (3) Frankie, Rhodes

Theory, practice, problems, and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3) Staff

For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor. (Spring)

387 **Administration of Adult Learning Programs** (3) Staff

Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations. (Fall)

388 **Case Studies in Higher Education Administration** (3) Marinaccio

Limited to advanced doctoral students in education. Analysis of selected hypothetical cases related to essential administrative functions of colleges and universities. Admission by permission of instructor.

389 **Consultant-Client Relationships in Human Resource Development** (3) Nadler, Luke

Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280; or approval of instructor. (Fall and spring)

390 **Legal Problems in Higher Education** (3) Frankl
Investigation of legal problems in higher education related to th legal structure of higher education, religious concerns, student faculty, and academic programs. (Spring)

391 **College and University Curriculum** (3) Greenberg, Frankl
Development, patterns, creative design, issues, problems, evaluation and trends in the higher education curriculum. (Fall)

392 **Financing Higher Education** (3) Frankl
Analysis of private, state, and federal revenue sources; student aid program budgets, and financial methods and practices. (Spring)

393 **Practicum in Higher Education** (3 to 6) Frankie, Greenberg
Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor. (Fall and spring)

394 **College and University Governance** (3) Marinaccio
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall)

395 **Problems and Practices in Educational Administrative Organization** (3 to 6) Marinaccio
Application of principles and practices concerned with change and evaluation of educational administration.

396 **Internship: Higher Education Administration** (3 to 6) Marinaccio, Greenberg
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

397 **Internship: Administration** (3 to 6) Staff
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

399 **Seminar: Applied Educational Administration** (3 to 6) Fleck
Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners.

Fourth Group

A master's degree from an accredited institution is prerequisite to all fourth-group courses. All fourth-group seminars are open to doctoral candidates or other post-master's degree students with approval of instructor. Study is individually planned on the basis of previous study and experience in the subject field to attain an advanced level of competence and to meet identified professional needs or field requirements.

Each of the following courses is offered fall and spring. Each course may be repeated for credit.

401 **Seminar: History of Education** (arr.) Boswell

403 **Seminar: Philosophy of Education** (arr.) Kulawiec

405 **Seminar: Human Growth and Development** (arr.) Rashid

411 **Seminar: Elementary Education** (arr.) — Baker

413 **Seminar: Secondary Education** (arr.) — Staff

421 **Seminar: Adult Education** (arr.) — Nadler

422 **Seminar: Higher Education Administration** (arr.) — Marinaccio

423 **Seminar: Higher Education** (arr.) — Marinaccio, Frankie

424 **Seminar: College Student Development** (arr.) — Burns

425 **Seminar: Teacher Education** (arr.) — Boswell, Baker

427 **Seminar: Human Resource Development** (arr.) — Nadler

431 **Seminar: Administration, Curriculum, and Supervision** (arr.) — Staff

443 **Seminar: Counseling** (arr.) — Staff

445 **Seminar: Research and Evaluation** (arr.) — Paratore, Smith

446 **Seminar: Reading** (arr.) — Peterson

490 **Pre-dissertation Seminar** (3–6) — Linkowski, Smith, Greenberg

Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. Admission by permission of instructor.

491 **Dissertation Research** (arr.) — Staff

Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major advisor and dissertation committee. Prerequisite: Educ 490.

Fifth Group

701 **Experimental Course** (3) — Staff

721 **Experimental Course—Interdepartmental** (3) — Staff

EDUCATION POLICY—DOCTORAL PROGRAM

Committee on Education Policy

A.V. Adams *(Chairman)*, J.R. Henig, A.D. Kirsch, C.J. Lange, P.H.M. Lengermann, M.N. Rashid, C.T. Stewart, Jr.

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and Human Development and from the Departments of Economics, Philosophy, Political Science, Psychology, Sociology, and Statistics.

The scope of the program is policy research and analysis as it relates to education, broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions.

Required: the general requirements, pages 91–93, 99–101. Students must complete three fields of study, one of which must be education policy analysis. The remaining fields will involve concentrations in two academic disciplines chosen by the student. Courses will be selected from departmental offerings.

201–2 **Seminar: Current Issues in Education Policy** (3–3) Adam
Review of interdisciplinary literature relating to current educatio policy issues with emphasis on use of research and analysis i formulating and evaluating policy.

222 **Seminar: Topics in Education Policy** (3) Adam
Intensive interdisciplinary study of special topics in education policy

290 **Advanced Studies in Education Policy** (3) Adam
Supervised interdisciplinary study and field work in a selected polic area.

399 **Dissertation Research** (arr.) Staf

ENGLISH

Professors C.D. Linton, P.H. Highfill, Jr., J.G. Allee, Jr., J.P. Reesing, Jr *(Chairman)*, E.R. Weismiller, R.N. Ganz, Jr.
Adjunct Professor J.C. Broderick
Associate Professors A.E. Claeyssens, Jr., R.C. Rutledge, J.A. Quitslund J.A.A. Plotz, J.H. Maddox, C.W. Sten, G.R. Bozzini
Associate Professorial Lecturer H. Wallace
Assistant Professors R.L. Combs, G. Carter, G. Paster, D. McAleavey, O.A. Seavey, G.S. Spiegel, A. Romines
Adjunct Assistant Professors C.H. Greer, F.C. Reid
Assistant Professorial Lecturers R.P. Rhinehart, K. Evans, T.E. Daugherty, E. Garner, M. Morrison, P. Aldrich, A. Blackwill, M. Coughlin, M. Dow, D. Greenwood, W. Mark, D. McConnell, E. Sundquist, D. Wells
Instructor M.A. Strom
Adjunct Instructors M. Cramer, E. Echeverria, M. Kirkland, C. Meloni, S. Thompson
Lecturers C.G. Beckjord, J. Greene, B.E. Dick, N. Arnesen, P. Carter, L. Cervantes, C. Crombie, P. Gudnason, N. Kauer, D.A. Morse, J. Shapiro, E. Thomas, J. Carroll, M. Heidish, F. Moskowitz, E. Perruso, W. Zaccagnino
Jenny McKean Moore Visiting Lecturer in Creative Writing B.M. Boyd

Bachelor of Arts with a major in American literature or English literature (field-of-study or departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses—Engl 51–52 or 61–62 or 71–72 or 191–92.

3. Required courses in related areas—(a) as appropriate, 3–12 semester hours or waiver of level 4, of a foreign language (classical Hebrew, Greek, Latin, French, German, Italian, Russian, or Spanish); (b) six semester hours of philosophy and/or religion; (c) six semester hours of history (English, American, European, or world).

4. Required for the major:

(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199–200,

and in English Literature, Engl 195–96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—30 semester hours of second-group courses offering experience with several approaches to literature which, together, make a discipline of literary study, distributed as follows:

American literature majors—Engl 120, 160, and either 161–62 or 163 and 167; three semester hours of English literature; and 15 additional hours of courses offered by the English Department, of which at least 12 hours must be in American literature.

English literature majors—Engl 120 and 194; Engl 112, 128, or 130; three semester hours of American literature; and 18 additional hours of courses offered by the English Department, of which at least 15 hours must be in English literature.

Minor in American or English literature—12 to 15 hours of second-group courses offered by the English Department, chosen in consultation with the advisor.

Master of Arts in the field of American literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements, pages 91–99, including (1) 24 semester hours of course work planned in consultation with the advisor on the basis of the student's undergraduate preparation, including a minimum of six semester hours in English literature; (2) a written Master's Comprehensive Examination; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major portion of the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Master of Arts in the field of English literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English or American literature, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements, pages 91–99, including (1) 24 semester hours of course work, planned in consultation with the advisor; (2) a written Master's Comprehensive Examination; and (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Doctor of Philosophy in the field of American literature—Required: the general requirements, pages 91–93, 99–101; high-level proficiency in an appropriate foreign language; the passing of a General Examination in the following four fields: (1) Early American literature—to 1815, (2) 1815–1900, (3) 1900 to present, (4) a fourth field, which may be either literary or interdisciplinary. Each student plans a program in consultation with a departmental committee.

Doctor of Philosophy in the field of English literature—Required: the general requirements, pages 91–93, 99–101; high-level proficiency in an appropriate foreign language; the passing of a General Examination in four of the eight following fields: 1) beginnings to 1500, linguistics, and history of the language; (2) 1500–1660; (3) 1660–1800; (4) 1800–1900; (5) 1900 to present; (6) drama, including Shakespeare; (7) criticism; (8) American literature—one of the first three fields listed above under "Doctor of Philosophy in the field of American literature." Each student plans a program in consultation with a departmental committee.

Bachelor of Arts in Education and Human Development with a teaching field in English—Prerequisite: the education curriculum, page 114.
Required: the English option and the professional courses listed on page 117.

Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, reading, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores or writing skill indicate superior competence will be allowed to waive Engl 10; those whose scores indicate markedly superior competence will be allowed to waive both Engl 10 and Engl 11 or 12.

The admission of international students to any English course is determined by the English Placement Test for Foreign Students. Students should apply to the office of English for International Students to take this test (see page 26). Course listings in the English as a Foreign Language Program are shown in the *College of General Studies Bulletin*

Departmental prerequisite: Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or written permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 160–61–62, and 191–92.

ENGLISH COMPOSITION

First Group

9 **English Composition: Language as Communication** (3) — Claeyssens and Staff

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours per week for a maximum of 10 weeks. Special fee, $25. (Fall and spring)

10 **English Composition: Language as Communication** (3) — Claeyssens and Staff

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

11 **English Composition: Language and the Arts and Sciences** (3) — Claeyssens and Staff

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12. (Fall and spring)

12 **English Composition: Language in Literature** (3) — Claeyssens and Staff

Study and practice of expository and argumentative techniques

through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and diction, and on logical thought, by the study of literary genres, and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11. (Fall and spring)

50 **English Composition/Research Methods for International Students** (3) Bozzini and Staff

An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. Special fee, $25.

Second Group

100 **Expository Writing in Accounting** (3) Strom

Special emphasis on writing related to accounting and auditing, with weekly exercises on designated topics; selected readings. Prerequisite: Engl 9 or 10; 11; junior status. (Fall and spring)

101 **Expository Writing** (3) Claeyssens and Staff

Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12. (Fall and spring)

102 **Introduction to Creative Writing** (3) McAleavey

Discussion of student poetry and/or prose fiction. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. (Fall and spring)

103 **The Writing of Fiction—the Short Story** (3) McAleavey

Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall)

104 **The Writing of Poetry** (3) McAleavey

Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Spring)

105–6 **The Writing of Plays** (3–3) Claeyssens

Same as SpDr 105–6. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration.

107 **The Writing of Fiction—the Novel** (3) Claeyssens

Prerequisite: Engl 102 or 103; consent of instructor. The student should submit a writing sample to the instructor before registration. (Spring)

108 **Advanced Creative Writing** (3) Claeyssens

Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Spring)

Third Group

201–2 **The Teaching of Composition** (3–3) Spiegel

(Academic year)

ENGLISH LITERATURE

First Group

51–52 **Introduction to English Literature** (3–3) Rutledge and Staff
Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature. (Academic year)

61 **Tragedy** (3) Carter
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett. (Fall)

62 **Comedy** (3) Paster
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges. (Spring)

Second Group

111 **Medieval English Literature—Exclusive of Chaucer** (3) Allee
(Fall)

112 **Chaucer** (3) Allee

115 **Introduction to English Linguistics** (3) Allee
Development of the English language in a historical treatment of English grammar. (Fall)

116 **Medieval Legend and Saga** (3) Allee
Celtic and Norse.

117–18 **English Poetry: Form and Content** (3–3) Weismiller
Traditional and modern poetry; emphasis on the ordering of language by which poetry brings into being patterns of thought and feeling which release meaning.

120 **Practical Criticism** (3) Plotz
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

123 **Principles of Literary Criticism** (3) Carter
Works of major critics; consideration of ways in which literature is analyzed, classified, judged, and justified; Aristotle, Longinus, Dryden, Johnson, Coleridge, Schiller, Arnold, Eliot, Richards, Frye. (Fall)

125–26 **Elizabethan Verse and Prose** (3–3) Quitslund

127–28 **Shakespeare** (3–3) Highfill
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Earlier 17th Century** (3) Reesing
Poetry and prose to 1660, exclusive of Milton.

130 **Milton** (3) Reesing
(Fall)

131–32 **English Literature, 1660-1780** (3–3) Highfill
Poetry and prose of the Neoclassic period. Engl 131: 1660–1740. Engl 132: 1740–1780. (Academic year)

133–34 **The Romantic Movement** (3–3) Plotz
Engl 133: Blake, Wordsworth, Coleridge. Engl 134: Byron, Shelley, Keats. (Academic year)

135–36 **Victorian Literature** (3–3) Carter
Engl 135: Tennyson, Browning, Arnold; Dickens; Carlyle, Ruskin. Engl 136: George Eliot, Browning, Tennyson, Swinburne, Hardy, Hopkins, Wilde, Pater. (Engl 136—fall)

137–38 **The 20th Century** (3–3) Linton
Literature since 1900. Engl 137: poetry and criticism. Engl 138: drama and the novel. (Engl 137—spring)

145–46 **Special Topics in English Literature** (3–3)
Each course may be repeated for credit.

147–48 **Special Topics in English Literature** (3–3) Maddox
Each course may be repeated for credit. (Engl 147—fall)

149 **The Romantic Movement** (3) Combs
Poetry and prose, 1780-1830. Students who receive credit for Engl 149 cannot receive credit for Engl 133 or 134.

151 **19th-Century British Poetry** (3) Staff
Readings in Wordsworth, Keats, Browning, and Swinburne.

153–54 **The English Novel** (3–3) Maddox
Major novelists. Engl 153: 18th century. Engl 154: 19th century. (Academic year)

155–56 **The English Drama** (3–3) Paster, Highfill
Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present.

157 **20th-Century Drama** (3) Paster
Representative continental, English, and American plays of the 20th century. (Spring)

158 **20th-Century British Prose Fiction** (3)

191–92 **Introduction to European Literature** (3–3) Seavey
Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid*; dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Open to freshmen and sophomores. May be taken to satisfy the requirement for meaningful initiation into the humanities. (Academic year)

194 **History of English Literature** (3) Reesing
(Spring)

195–96 **Proseminar in English Literature** (3–3) Quitslund
For field-of-study majors in English literature. Themes and concerns basic to the English literary tradition, which draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) — Reesing and Staff
Open to honors candidates in the field-of-study major in English literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) — Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

Third Group

212 **Studies in Chaucer** (3) — Allee
(Spring)

213 **Old English** (3) — Allee
Old English grammar and readings. (Fall)

214 **Beowulf** (3) — Allee
Prerequisite: Engl 213 or equivalent. (Spring)

217 **English Poetry: The Formal Development** (3) — Weismiller

218 **Form and Content in Modern Poetry** (3) — Weismiller

219 **Research Methods and Bibliographical Materials** (3) — Broderick
Principal bibliographical sources and typical problems in research. (Fall)

223–24 **Studies in Literary Criticism** (3–3) — Plotz

225–26 **Studies in 16th-Century English Literature** (3–3) — Quitslund

227–28 **Studies in Shakespeare and his Contemporaries** (3–3) — Paster
(Engl 227—fall)

229 **Studies in English Literature, 1600-1660** (3) — Reesing
Chief figures exclusive of Milton.

230 **Studies in Milton** (3) — Reesing

231–32 **Studies in English Literature, 1660–1780** (3–3) — Highfill

233–34 **Studies in the Romantic Movement** (3–3) — Plotz

235–36 **Studies in Victorian Literature** (3–3) — Carter

237–38 **Studies in 20th-Century Literature** (3–3) — Linton
(Engl 237—fall)

253–54 **Seminar: The English Novel** (3–3) — Maddox
(Engl 254—spring)

255–56 **Studies in Dramatic and Theatrical History** (3–3) — Highfill
Engl 256: Seminar in drama and theater of the Restoration and 18th century, held among the Folger Library collections. A Folger Institute Seminar.

299–300 **Thesis Research** (3–3) — Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the English Department.

301–308 **Folger Institute Seminars** (3 credits each) — Staff
Topics will be announced.

398 **Advanced Reading and Research** (arr.) — Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

First Group

71–72 **Introduction to American Literature** (3–3) — Ganz and Staff
Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present. (Academic year)

Second Group

120 **Practical Criticism** (3) — Plotz
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

160-61-62 **Studies in American Literature** (3–3–3) — Seavey, Sten
Same as AmCv 160–61–62. Major factors in the national cultural tradition as shown by outstanding writers. (Engl 160, 162—fall; 161—spring)

163–64 **Major American Poets** (3–3) — Ganz
Advanced critical study of significant writers and movements. Engl 163: From beginnings through the 19th century. Engl 164: The 20th century. (Academic year)

165–66 **American Drama** (3–3) — Combs, Claeyssens
Historical and critical study of significant plays and forms. Engl 165: From beginnings to 1930. Engl 166: Since 1930. (Academic year)

167–68 **The American Novel** (3–3) — Sten, Maddox
Historical and critical study of significant novels. Engl 167: From beginnings through the 19th century. Engl 168: The 20th century. (Academic year)

170 **The American Short Story** (3) — Combs
Historical development of the American short story. (Spring)

171–72 **Major American Writers** (3–3)
Each course may be repeated for credit.

173–74 **Selected Literary Movements** (3–3) McAleavey, Ganz
Each course may be repeated for credit. (Spring)

175–76 **Special Topics in American Literature** (3–3) Romines, McAleavey, Carter
Each course may be repeated for credit. (Academic year)

177–78 **Contemporary American Literature** (3–3) Ganz, Claeyssens
Major and representative works since World War II. (Academic year)

181–82 **TBA** TBA
Two special courses offered each year by the Jenny McKean Moore Visiting Lecturer in Creative Writing. Each course may be repeated for credit. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major in American literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in American literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Sten
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

Third Group

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

263–64 **Studies in American Poetry** (3–3) Ganz
(Engl 264—fall)

267–68 **Seminar: American Fiction** (3–3) Maddox
Research and critical reading: fiction and the criticism of fiction. (Engl 267—fall)

281–82 **Seminar: Early American Literature** (3–3) Seavey
(Engl 281—spring)

283–84 **Studies in American Romanticism** (3–3) Broderick
Engl 283: Melville—the early fiction. Engl 284: Emerson, Thoreau, and the Concord Group: the intellectual background and the literary achievement. (Engl 284—spring)

285–86 **Seminar: American Literature, 1865-1900** (3–3) Romines
Realism in America. (Engl 286—spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ENVIRONMENTAL STUDIES

Committee on Environmental Studies

A.K. Fitzsimmons *(Chairman)*, O. Bergmann, R.S. French, R.W. Kenny, R.C. Lindholm, H. Merchant, W.E. Schmidt, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. The program leading to the degree of Bachelor of Arts is designed for the student who is oriented toward participating in environmental decision-making with emphasis on the perspective of the social sciences. The program leading to the degree of Bachelor of Science is designed for the student with well-developed interests in science who seeks professional identification as a field or laboratory worker in the environmental sciences.

Bachelor of Arts with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):
   (a) Statistics—Stat 91.
   (b) Natural sciences—six to eight semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2, 21–22; or Phys 1, 2. Courses designated for non-science majors must be passed with a grade of *A* or *B* to be accepted toward fulfilling the introductory natural science requirement. This includes BiSc 3–4 and Geol 1–2.
   (c) Social sciences—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 1, 2, 3; PSc 1 or 3, 2; Psyc 1, 5–6; or Soc 1, 2.
3. Required courses in the major (48 semester hours):
   (a) BiSc 140 (four semester hours).
   (b) Eight semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 185, 198, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 183, 181, 272; Phys 6, 14, 15, 16, 27–28.
   (c) 30 semester hours in courses selected from two departments in the following—Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 132, 134, 135, 136, 137, 140, 142, 143, 145, 221, 222; PSc 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.
   (d) Envr 151–52 (six semester hours).

Bachelor of Science with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses (qualified students may substitute advanced cours with departmental permission, in order to include more elective courses in the program):

(a) Statistics—Stat 91.

(b) Natural sciences—12 to 16 semester hours selected from BiSc 11–1 Chem 11-12; Geol 21–22; Phys 1, 2. Either BiSc 11–12 or Chem 11–12 must selected.

(c) Social sciences—12 semester hours selected from Anth 1–2; Econ 1- Geog 1, 2, 3; PSc 1 or 3, 2; Psyc 1, 5–6; Soc 1, 2.

3. Required courses for the major (48 semester hours):

(a) BiSc 140 (four semester hours).

(b) 20 semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 1 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 1 208, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 1 141, 163, 181, 272; Phys 6, 14, 15, 16, 27–28.

(c) 18 semester hours selected from Anth 151, 152, 171, 186, 187, 188, 26 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 106, 107, 108, 110, 127, 1 134, 135, 136, 137, 140, 142, 143, 145, 221, 222; PSc 104, 111, 112, 117, 118, 1 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 151, 152, 181.

(d) Envr 151–52 (six semester hours).

The science and social science courses listed under 3(b) and 3(c) above mu be taken in not more than three departments. Not more than six hours service-learning courses may count toward fulfilling requirements of the majo

In choosing elective courses for both the Bachelor of Arts and Bachelor Science degree programs, students are reminded that permission of the Dea of Columbian College of Arts and Sciences and the Committee on Enviro mental Studies is necessary to take courses not offered by Columbian Colleg of Arts and Sciences, and that a maximum of 12 semester hours of such course may be taken. The following may be of interest to the environmental studie major: BAd 101, 171, 201, 203; *CE 194, 197; HKLS 152; U&RP 153, 201, 20 The permission of the instructor, the department chairman, and the Dean the School of Government and Business Administration is necessary to tak graduate courses (numbered 201 and above) in that School.

151–52 Senior Seminar in Environmental Studies (3–3) Staf

Limited to majors in environmental studies. Directed reading an discussion of contemporary environmental problems.

157 Introduction to Environmental Law (3)

An introduction to selected pieces of major environmental legisla tion. The role of the courts and bureaucracy in implementing an interpreting legislation. Impact on decision-making. Designed fo students with no training in law.

158 Special Topics in Environmental Law (3)

Analysis of environmental laws which focus on a particular enviro mental issue. Topics will vary. Prerequisite: Envr 157 or permissio of instructor.

159–60 Field Experience (3–3)

Open to juniors and seniors majoring in environmental studies. St dents will spend at least eight hours per week in a political, tech nical, legal, or special interest organization working on environmenta questions.

* See the *School of Engineering and Applied Science Bulletin* for civil engineering courses.

EXPERIMENTAL HUMANITIES*

Associate Professor R.S. French *(Director)*
Adjunct Associate Professor L.J. Lear
Assistant Professor D.J. Lynn
Adjunct Instructor P.E. Wallace, Jr.

EXPERIMENTAL HUMANITIES

First Group

2–3 Politics and Values (3–3) — Staff

A freshman course: limited enrollment. Students will be housed in Thurston Hall. Field-study and case-study of value conflicts implicit in selected political issues involving federal policy and legislation. Concurrent registration in special sections of PSc 2 and 3 required. Students registering for Hum 2 in the fall semester will be expected to register for Hum 3 in the spring semester. Admission by permission of instructor. (Fall and spring)

26 Environmental Issues (3) — French, Fitzsimmons, Merchant

Joint offering of the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science. An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Spring)

40 Washington, D.C.: Culture and Politics (3) — Lear and Interdisciplinary Team

An all-university course designed primarily for freshmen and transfer students. Major facets of metropolitan life, past and present, analyzed by faculty, students, and community leaders. (Fall)

91 The Creative Process (3) — Claeyssens and Interdisciplinary Team

The process of invention in the fine and popular arts is studied in Hum 91 through exchanges with practicing artists at their rehearsals and studios and through class discussions with visiting artists and critics. Examination of documents in which artists in various fields discuss work in progress. Professors of drama, dance, film, art, and English participate. (Academic year)

Second Group

101–2 Supervised Field Study (6–6) — French

Community-based projects supervised by appropriate faculty. Juniors and seniors admitted by permission of instructor. Prerequisite to Hum 102: Hum 101. (Hum 101 and 102—fall and spring)

171 The Legal Process (3) — Wallace

The function which law plays in society and the nature of the legal process. Examination of the societal assumptions and values that

* Administered by the Division of Experimental Programs.

mold the law. Emphasis upon institutions that make up the law—th courts, administrative agencies, legislative bodies, and executiv agencies. Open only to juniors and seniors by permission of instru tor. (Academic year)

174 **Science and Values** (1 or 3) Schmidt, Park
Study of the effects of scientific knowledge and technology on soci institutions and the image of man, of the question of ethics an morality in science, and of the science of values. Admission by per mission of instructor.

198 **Conference on Policy Studies and the Humanities** (3) Lyn
Examination of a selected policy issue (e.g., health care, freedom o information, drug abuse) in relation to alternative social goals. Ope to graduate, law, and medical students, as well as advanced under graduates by permission of instructors.

SERVICE-LEARNING EXPERIMENTAL HUMANITIES

See **Service-Learning Program.**

FORENSIC SCIENCES—GRADUATE PROGRAMS

Professors T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chairman)*
Professorial Lecturers B.J. White, C.B. Cunningham
Adjunct Professor C.G. McWright
Associate Professors N.T. Lappas, W.F. Rowe
Associate Professorial Lecturers D.D. Garner, J.T. Smith, J.T. Wieseman G.M. Saiger, R.S. Bennett, E.G. Howe, C.E. Bohn, J.L. Melnick, K.E Melson, J.D. Kogan, H.F. Schuelke III, L.H. Wechsler, D.S. Dixon
Assistant Professorial Lecturers J.P. Hume, N.R. Janis, M. Stajic, J.L. Lyons A.J. Graham, G.M. Richman, R.I. Richter, E.D. Ross, Jr., B.W. Given, D Beard, J. Blumenfeld, R.B. Schulman

Master of Forensic Sciences—Prerequisite: a bachelor's or a graduate degree from an accredited institution of higher learning and academic or professiona experience in the behavioral, biological, or physical sciences, or law, medicine or law enforcement.

Required: the general requirements, pages 91–99. For students not electing a thesis, 36 semester hours of course work are required; for students electing a thesis, 30 semester hours of course work, plus a thesis (equivalent to six semester hours), are required. ForS 220, 221, 224, and 225 are required of all students. ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited law school. The following are also required: (1) nine hours selected from ForS 201, 202, 203, 204, and 205; (2) nine hours selected from ForS 214, 260, 261, 265, and 269; (3) the remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement

Master of Science in Forensic Science—Prerequisite: a bachelor's or graduate degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements, pages 91–99. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to six semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. Candidates must also fulfill the tool requirement by passing a reading knowledge examination in French, German, or Russian, or by satisfactorily completing the tool requirement in either statistics or computer programming.

Master of Arts in Special Studies—Prerequisite: a bachelor's or graduate degree from an accredited college or university.

a) *With a concentration in Criminal Justice*—

Required: the general requirements, pages 91–93. The program of study consists of 36 semester hours of approved course work drawing from the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 214, 220, 221, 224, 225, 228, 265, 266, 274; Soc 259, 261, 262 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

b) *With a concentration in Crime in Commerce*—

Required: the general requirements, pages 91–93. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, accounting, computer science, investigative techniques, and management. ForS 203, 224, 225, 229, 232, 233, 234, 235, 251, 267, 274, and Stat 197 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

The interdisciplinary programs leading to the degrees of Master of Arts in Special Studies, Master of Forensic Sciences, and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, from the National Law Center, from the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology in a program of mutual exchange among students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

201 Forensic Serology I (3) Lappas

Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology. Laboratory exercises.

202 Instrumental Analysis (3) Perros, Rowe

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry. Laboratory exercises.

203 Examination of Questioned Documents (3) Bol
Theory and principles of handwriting and handprinting, duplicati processes, paper manufacture and fiber analysis; studies of pap and methods of examining questioned documents. Laboratory e ercises.

204 Firearms and Tool-mark Identification (3) Cunningham, Row
Methods for identifying firearms, cartridge casings, tool-marks, t marks, and footprints. Laboratory exercises.

205 Personal Identification (3) Given, Thompso
Methods of personal identification based on sketches, fingerprint voiceprints, odontology, and study of skeletal remains.

214 Forensic Psychiatry (3) Howe, Saiger, Smit
Introduction to the constructs of dynamic psychiatry, psychiatr treatment, and the nomenclature of mental disorders. Consideratio of expert testimony, direct examination, and cross-examination hospitalization and criminal cases.

220 Physical Aspects of Forensic Sciences (3) Given, O'Rear, Row
Survey of forensic physical sciences; fingerprints, firearm and too mark examinations, document examinations, and examinations trace evidence such as glass, soil, paint, hairs, and fibers; crime scen investigations; qualifications and preparation of expert witnesses operation and functioning of the forensic science laboratory.

221 Biological Aspects of Forensic Sciences (3) Lappas, Row
Principles of forensic pathology, serology, and toxicology. The ro of the forensic laboratory in the identification of human remains; de termination of the time, cause, and manner of death; partial indi vidualization of biological materials; and the detection of drugs biological materials.

224 Criminal Law I (3) Starrs, Hume, Bennett, Beard
Principles of criminal law and procedure, preparation and presenta tion of evidence, examination of witnesses, and methods of lega research.

225 Criminal Law II: Evidence (3) Bennett, Melson, Melnic
Procedural rules affecting the collection and use of physical ev dence. Emphasis on court opinions defining the rules of search an seizure and admissibility of evidence. Prerequisite: ForS 224.

227 Criminal Law III: Procedure (3) Schuelke, Wechsle
Decision to arrest, prosecutive discretion, bail, the preliminary hear ing, right to a speedy trial, discovery, plea bargaining, publicity post-conviction procedures. Prerequisite: ForS 224.

228 Administration of Criminal Justice (3) Schulman, Ros
Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and profes sional responsibilities of prosecutor and defense counsel and on de velopmental trends in the law. Prerequisite: ForS 224.

229 Criminal Law IV: Contracts (3) Staff
Concepts and principles of law encountered in commercial activities contracts, sales, negotiable instruments, and bankruptcy. Emphasi

on recognition of deceptive contracting practices. Statutes and government regulation governing contracts.

232 **Crime in Commerce I: Accounting** (3) Staff
Principles of accounting; abuse and misuse of accounting procedures; use of accounting in the investigation of commercial crime.

233 **Crime in Commerce II: Procurement and Supply** (3) Staff
Governmental and private sector procurement procedures; techniques of inventory management; abuse of procurement procedures and illicit diversion of supplies.

234 **Crime in Commerce III: Information Systems** (3) Staff
Principles of management information systems; security of information system and facilities; compromising of information systems.

235 **Crime in Commerce IV: Conspiracy** (3) Staff
Legal definition of conspiracy; quantum of proof; use of investigative techniques to establish the existence of criminal conspiracies.

250 **Interdisciplinary Aspects of Forensic Science** (3) Starrs
Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs. individualized evidence, and search and seizure. Prerequisite: ForS 224.

251 **Moot Court** (3) Janis, Kogan, Wechsler
Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.

254 **Selected Topics in the Forensic Sciences** (3) Staff
Current issues in research, investigation, and law.

260 **Principles of Forensic Medicine** (3) Staff
Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3) Dixon
Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **Drugs of Abuse** (3) Lappas, O'Rear, Stajic
Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std. degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear
Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

267 **Seminar: Crime in Commerce** (3) Sta
Interdisciplinary course in current problems in the investigation a
prosecution of commercial offenses.

268 **Photography in the Forensic Sciences** (3) Sta
Basic use of forensic photography, including selection and use
equipment, photographs as evidence, close-up work, and comm
misconceptions. Laboratory fee, $25.

269 **Forensic Toxicology I** (3) Lapp
Relevant underlying biological, chemical, and pharmacological pri
ciples of forensic toxicology.

270 **Medicinal Chemistry** (3) O'Re
Theory and principles of classification, synthesis, and structu
activity relationships of drugs. Discussion of the complex chemic
events that take place between administration of a drug and
action on the user, with emphasis on drugs of abuse.

271 **Forensic Serology II** (3) Lapp
Methods in forensic serology. Laboratory examinations and clas
fications of dried blood and other biological materials. Independe
laboratory projects. Laboratory fee, $25. Prerequisite: ForS 201,
permission of instructor.

272 **Forensic Toxicology II** (3) Lapp
Lectures, student seminars, laboratory exercises, and projects deali
with topics of current interest in forensic toxicology. Prerequisit
ForS 269 or permission of instructor. Laboratory fee, $25.

273 **Forensic Chemistry I** (3) Row
Examination of glass, soils, hairs, and fibers. Laboratory exercis
include refractive index measurements using immersion method
polarized light observations of minerals, hairs, and fibers; elemen
analysis of glass and soil by spectroscopic methods; x-ray diffracti
analysis of minerals; and classical chemical and physical methods
analysis. Prerequisite: ForS 202 or permission of instructor. Labor
tory fee, $25.

274 **Management of Criminal Justice Organizations** (3) O'Rear, Whi
Theories of management with emphasis on leadership. Interaction
individuals, groups, managers, and the organization as a whole. D
cussions centered on the criminal justice system.

280 **Forensic Chemistry II** (3) Row
Examination of arson accelerants, textile fibers, plastics, and pain
Laboratory exercises include infrared spectrophotometry and pyro
sis—gas-liquid chromatography of polymeric materials, as well
classical chemical and physical methods of analysis. Prerequisi
ForS 273. Laboratory fee, $25.

295 **Research** (arr.) St
Open to qualified master's degree students. Research on proble
approved by the department chairman or academic advisor, un
the supervision of an appropriate staff member.

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

FRENCH

See **Romance Languages and Literatures.**

GENERAL CURRICULUM IN THE LIBERAL ARTS

Bachelor of Arts: General Curriculum in the Liberal Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. *Humanities*—39 semester hours:

(a) 6 semester hours selected from Engl 9 or 10, 11 or 12, 101.

(b) 18 semester hours (of which 6 semester hours must be in a foreign language) selected from Chin 163–64; Clas 71, 72, 108, 113; Engl 51–52, 61–62, 71–72, 127–28, 153–54, 155–56, 160 in combination with 161 or 162, 163–64, 165–66, 167–68, 170, 191–92; Fren 51–52, 60 in combination with 51 or 52, 91–92; Ger 51–52, 103–4, 111–12, 126, 161–62; Slav 91–92; Span 51–52, 91–92.

(c) 6 semester hours selected from Phil 111, 112, 113.

(d) 3 semester hours selected from Rel 9, 10, 21, 59, 60, 103, 104, 105, 107, 111, 113, 114, 115, 116, 126, 137, 143, 144, 145.

(e) 6 semester hours selected from Art 1, 31–32, 71–72, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 140, 145, 147, 148, 149, 150, 155, 156, 161, 162, 165, 167, 169–70; Mus 3, 4, 7, 101–2, 103–4, 109, 110, 121, 125; SpDr 45, 49, 126, 143, 144, 165–66.

3. *Social Sciences*—18 semester hours:

(a) 6 semester hours selected from Hist 108, 109, 110, 111–12, 121, 122, 123–24, 171–72, 175–76, 179–80, 183.

(b) 6 semester hours selected from courses in economics; or 6 semester hours selected from courses in political science.

(c) 6 semester hours selected from courses in American civilization, anthropology, geography and regional science, psychology, or sociology.

4. *Natural and Mathematical Sciences*—18–22 semester hours:

(a) 6–8 semester hours in each of two laboratory sciences selected from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2 or 21–22; Phys 1–2 or 9–10.

(b) 6 semester hours selected from courses in mathematics (excluding Math 3 and 6).

5. *Electives*—41 semester hours of courses selected in consultation with the advisors.

A major is optional. If a student chooses a major, elective courses may be used to fulfill the requirements for it.

The requirement of 6 semester hours of literature in a foreign language may be fulfilled by selection from any of the first- or second-group foreign-language courses in literature. The requirement presupposes foreign-language competency, which a student may achieve, if necessary, through elective courses.

A student must pass a minimum of 45 semester hours of second-group courses. By passing an examination administered or authorized by the appropriate department, a student may waive introductory courses that are prerequisite to more advanced courses.

GENETICS—GRADUATE PROGRAMS

Committee on Genetics

S.O. Schiff *(Chairman)*, W.F. Anderson, D. Brusick, R. Crystal, R.F. De Giovanni-Donnelly, R.C. Gallo, C.B. Jacobson, D. Johnson, K.E. Johnson, P.D. Kind, K. Krell, J.W. Larsen, W.M. Leach, R. Mage, C.R. Merril, A. Mescher, W.G. Nash, S. O'Brien, J.C. Petricciani, D. Picciano, K.N. Rosenbaum, M. Schanfield, J. Schlom, K. Todaro

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Anatomy, Biochemistry, Biological Sciences, Microbiology, Obstetrics and Gynecology; and from government agencies and private industry.

A baccalaureate degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: eight semester hours each in biology, inorganic chemistry and organic chemistry; six semester hours in physics; and six semester hours in English composition and literature. While not required for admission, courses in embryology, genetics, and mathematics are strongly recommended.

Master of Science in the field of genetics—Required: the general requirements, pages 91–99. The 30 semester hours required in this program must include Gnet 201 and Gnet 299–300. The remaining 22 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from the departmental courses listed below. The tool requirement may be met by satisfactorily completing an approved course in biostatistics or by passing a foreign language reading examination.

Doctor of Philosophy in the field of genetics—Required: the general requirements, pages 91–93, 99–101. The program of study must include Gnet 301, eight to 10 semester hours of biochemistry, six to eight semester hours of cell biology, 10 to 12 semester hours of genetics, and two or three semester hours of statistics. These courses may be selected from the departmental listings below. The tool requirement may be met by the satisfactory completion of an approved course in biostatistics and the passing of a foreign language reading examination, preferably in French or German.

GENETICS

Third Group

201 **Advanced Problems in Genetics** (2) Staff

Lectures on selected topics by members of the Committee on Genetics. Required of all master's degree candidates in the Genetics Graduate program. (Fall)

295 **Research** (arr.) Staff

Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Academic year)

Fourth Group

301 **Advanced Problems in Genetics** (2) Staff
Lectures on selected topics by members of the Committee on Genetics. Required of all Ph.D. candidates in the Genetics Graduate program. (Fall)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANATOMY

203 *Human Embryology* (1)
256 *Human Genetics* (1)
260 *Electron Microscopy in Cellular Biology—Lecture* (1)
261 *Transmission Electron Microscopy* (3)

BIOCHEMISTRY

221–22 *General Biochemistry* (3–4)
223–24 *Biochemistry Laboratory* (1–1)
227 *Biochemistry Seminar* (1)
229 *Biochemistry of Enzymes* (1)
232 *Protein Chemistry I* (1)
233 *Protein Chemistry II* (1)
241 *Isotopes* (3)
266 *Biochemical Genetics and Inherited Metabolic Diseases* (2)

BIOLOGICAL SCIENCES

Biology

111 *Introductory Microbiology* (4)
122 *Cell Biology* (3)
123 *Cell Biochemistry* (3)
124 *Cell Biochemistry Laboratory* (2)
127 *Genetics* (3)
128 *Genetics Laboratory* (1)
138 *Advanced Genetics* (3)
167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)
220 *Seminar: Cell Physiology* (3)

227 *Seminar: Genetics* (3)
228 *Population Genetics* (3)
229 *Cytogenetics* (3)
230 *Human Genetics* (3)
248 *Analysis of Development* (3)
249 *Seminar: Developmental Biology* (3)

Zoology

145 *Introduction to Vertebrate Embryology* (4)
146 *Experimental Developmental Biology* (4)
212 *Seminar in Comparative Reproductive Biology* (3)

MICROBIOLOGY

211 *Microbiology* (4)
214 *Tissue Cell Culture and Somatic Variation* (3)
229 *Immunology* (3)
230 *Immunology Laboratory* (2)
231 *Immunobiology* (1)
233 *Virology* (3)
234 *Virology Laboratory* (2)
258 *Microbial Genetics* (2)
260 *Cellular Immunology* (1)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology* (3)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)

STATISTICS

91 *Principles of Statistical Methods* (3)
127 *Statistics for the Biological Sciences* (3)
153–54 *Mathematical Models in Population Genetics* (3–3)

GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon, J.C. Lowe
Professorial Lecturers J.W. Nystrom, J. Baclawski, S. Baum, E. Marasciulo
Associate Professors E.O. Pederson *(Chairman)* A.K. Fitzsimmons
Associate Professorial Lecturer P. True
Assistant Professor C.T. Perin
Assistant Professorial Lecturers D.E. Starsinic, J.F. Long, S.E.S. Mastran J. Fehrenbach

Bachelor of Arts with a major in geography (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Required courses in the major—Geog 1 or 2 and 3; 30 semester hours of second-group geography and regional science courses, including Geog 105, to be chosen in consultation with the undergraduate advisor.

Minor in geography—Required: one course from each of the following groups: cultural, population, and political geography: Geog 127, 145, 146; economic geography: Geog 2, 125, 141; physical geography: Geog 107, 108; resource management: Geog 132, 134, 135; urban geography: Geog 140, 142, 143.

Master of Arts in the field of geography—Prerequisite: a Bachelor of Arts degree with a major in geography from this University, or an equivalent degree.
Required: the general requirements, pages 91–99. The minimum requirement consists of 30 semester hours of approved course work including a thesis; with the approval of the department, a student may elect a program of study without a thesis, but must then complete 36 hours of approved course work. A Master's Comprehensive Examination in three fields is required. Candidates must fulfill the tool requirement in one of three ways: (1) passing a reading knowledge examination in an approved foreign language; (2) satisfactorily completing six semester hours in statistics selected from Stat 105, 117, 118, 155, 159, 187, 188; or (3) satisfactorily completing Stat 106 and 110 (computer programming).

Bachelor of Arts in Education and Human Development with a teaching field in geography—Prerequisite: the education curriculum, page 114.
Required: the geography option and the professional courses listed on page 118.

Master of Arts in Education and Human Development with a field in elementary or secondary education (specializing in geography)—Prerequisite: a bachelor's degree with sufficient concentration in geography to permit successful pursuit of graduate study in the Department of Geography and Regional Science. Candidates must be accepted by both the School of Education and Human Development and the Department of Geography and Regional Science.
Required: the general requirements, pages 124–28, including 15 semester hours of graduate courses in geography and regional science.

First Group

1 **Introduction to Geography** (3) Staff
(Formerly Geog 51)
General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts. (Fall and spring)

2 **Introduction to Economic Geography** (3) Pederson
(Formerly Geog 52)
Examination of the basic principles which determine the location of economic activities. (Spring)

3–4 **Introduction to Physical Geography** (3–3) Perin
Processes affecting the character of the physical components of the natural environment. Laboratory fee, $18 per semester. (Academic year)

26 **Environmental Issues** (3) Staff
Joint offering of the Division of Experimental Programs and the Biological Sciences and Geography and Regional Science Departments. An interdisciplinary analysis of selected aspects of the population

question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

104 **Special Techniques in Cartography** (3) Fehrenbach
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $18. (Spring)

105 **Scope and Methods of Geography** (3) Perin
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. Admission by permission of instructor. (Fall)

106 **Introduction to Remote Sensing** (3) Fehrenbach
Examination of the principles and applications of remote sensing techniques using aerial photography and satellite imagery. Laboratory fee, $18. (Fall)

107 **Meteorology** (3) Perin
Weather processes, systems, and controls. Laboratory fee, $18. (Fall)

108 **Climatology** (3) Perin
Climatic elements and their controls; analysis of world climatic regions.

110 **Geography of Desertification** (3) Perin
Man, climate, and change in arid regions. (Spring)

115 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

125 **Transportation Geography** (3) Lowe
Consideration of the spatial aspects of interaction, diffusion, and information transfer, including nodal activity and hierarchies, network geometry, gravity models, and diffusion processes. (Fall)

127 **Population and Settlement** (3) Mastran
Patterns of world population; factors contributing to population pressures, growth, and migrations. (Spring)

132 **Resource Management and Conservation** (3) Fitzsimmons
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies. (Fall)

* An interdepartmental course offered by the Geography and Regional Science, East Asian Languages and Literatures, Economics, History, Philosophy, Political Science, and Religious Departments.

133 **Food and Regional Development** (3) Gordon
Spatial aspects of food production and agricultural development. (Spring)

134 **Geography of Energy Resources** (3) Fitzsimmons
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations.

135 **Resources and Environmental Quality** (3) Fitzsimmons
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence man's use of resources.

136 **Geography of Water Resources** (3) Perin
Analysis of the spatial patterns, development, and use of water resources.

137 **Environmental Hazards** (3) Perin
Examination of natural hazards in terms of their types, distribution, and impact on human activities. (Spring)

140 **Urban Geography** (3) Pederson
Analysis of the internal spatial structure of cities; emphasis on explaining patterns of location within the city. (Fall)

141 **Urban Settlement** (3) Pederson
The location of cities, urbanization processes, theories and models of urban location and development.

142 **Urban Environments** (3) Lowe
Consideration of the climatic, hydrological, and other selected aspects of the physical geography of the city, as well as of the nature, organization, and spatial patterns of urban delivery systems. (Spring)

143 **Social Geography** (3) Lowe
Consideration of behavioral aspects of geography incorporating spatial cognition, spatial behavior, social space, migration processes, and conflicts in spatial decision-making. (Fall)

145 **Cultural Geography** (3) Fitzsimmons
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations. (Spring)

146 **Political Geography** (3) Pederson
Interrelationships among the human and physical environment and political systems; the organization of political territories. (Spring)

154 **Geography of the Middle East** (3) Gordon
Cultural and physical regional patterns of the Middle East. (Fall)

161 **Geography of Latin America** (3) Gordon
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. (Spring)

189–90 **Readings in Geography** (arr.) Staff
(Academic year)

198 **Topics** (3) Staff
A consideration of geographic aspects of topical and future problems of society. Topics change each year. May be repeated for credit.

199 **Practicum** (3) Staff
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography.

Third Group

215 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen
Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science. Field study in Mexico. (Summer)

219 **Seminar: Climatology** (3) Perin
Physical and cultural aspects of climatic systems. (Spring)

220 **Climates of the Past and Climate Modification** (3) Perin
Climatic history, hypotheses of climatic change and inadvertent modification.

221 **Seminar: Cultural Geography** (3) Fitzsimmons
Study of the noneconomic processes which affect the location of human activity. Topics to be discussed are environmental perception and evaluation, social definitions of space, and diffusion of innovations. (Fall)

222 **Seminar: Resources and the Environment** (3) Fitzsimmons
Analysis of the spatial variations and interrelationships of resources and the environment.

223 **Seminar: The Population-Food Balance** (3) Gordon
Spatial problems associated with the dynamics and interaction of population growth and agricultural output.

224 **Seminar: Political Geography** (3) Pederson
Examination of the political factor in location theory and analysis of the nature of political territories. (Fall)

225 **Seminar: Transportation Geography** (3) Lowe
Analysis of human spatial interaction; emphasis on networks, graph theory, gravity, interaction and potential models, migration models and diffusion processes. (Spring)

243 **Seminar: Urban Geography** (3) Lowe
Functional processes affecting the evolving morphology and internal spatial patterns of urban phenomena; emphasis on economic factors, behavioral considerations, and impact of time.

244 **Seminar: Urban Systems** (3) Pederson
Central place theory and other theories of urban location and the organization of systems of cities.

261 **Seminar: Geography of Latin America** (3) Marasciulo
Selected topics related to population, environment, and land use in Latin America. (Fall)

265 **Seminar: Geography of the Soviet Union** (3) **Baclawski**
Physical features, economic geography, natural and energy resources, industries, transportation, agriculture, population trends, and borderland problems. (Spring)

266 **Seminar: Geographic Perspectives on Contemporary China** (3) **True**
China's development prospects: environmental constraints, population growth, and regional differences in context of Chinese cultural patterns and political organization. (Fall)

287 **Seminar: Problems in Latin American Civilization** (3) **Staff**
Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) **Baum**
Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) **Long**
Joint offering of the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Research** (arr.) **Staff**
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

GEOLOGY

Professors G. Teleki *(Emeritus)*, G.V. Carroll, F.R. Siegel *(Chairman)*, A.G. Coates, R.C. Lindholm, J.F. Lewis
Adjunct Professors J.W. Pierce, I.G. Sohn, M.A. Buzas
Professorial Lecturers N. Hotton, D. Appleman, I. Zietz
Associate Professorial Lecturers W.E. Maloney, A. Geiger, M.D. Turner, W. Back
Assistant Professor G.C. Stephens
Assistant Professorial Lecturer F.J. Collier
Lecturer R.T. Rye

Bachelor of Arts or Bachelor of Science with a major in geology (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Required introductory course—Geol 21–22.
3. Required courses in related areas (a) Chem 11–12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or Phys 1 or 3 (for the degree Bachelor of Arts); BiSc 11, and Phys 1 or 3 (for the degree Bachelor of Science).

4. Required courses in the major—Geol 111, 112, 117, 118, 122, 123, 151–52 for both the degree of Bachelor of Arts and Bachelor of Science; Geol 128, 166, 189, 195 for the Bachelor of Science degree only.

Bachelor of Science with a major in geology—engineering option (engineering geology) (departmental)—An interdisciplinary curriculum offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. (Students wishing to work toward the degree of Bachelor of Science [Civil Engineering] with a geology option [geotechnical engineering] should consult the *School of Engineering and Applied Science Bulletin.)* The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Required introductory courses—ApSc 57, 58, 113; Chem 13; EE 51; Geol 21–22; Math 31, 32, 33; Phys 14, 16; or equivalents.

3. Required courses in the major: CE 120, 140, 166, 167, 168, 182, 185; Geol 111–12, 117, 118, 122, 136, 189, 195, and one course chosen from Geol 128, 141, or 163; Math 111, 112; ME 126, 131; Stat 91 or 102 or ApSc 115.

Minor in geology—18 semester hours selected with approval of the departmental advisor to undergraduates, including 6 hours of introductory geology (Geol 1–2; 5 and 106; 21–22); two selected from Geol 111, 122, and 151; and two from Geol 105, 110, 125, 154, or from requirements of the B.A. and B.S. (For students with special interdisciplinary interests, substitutions can be arranged.)

Master of Science in the field of geology—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University, or an equivalent degree, and the Graduate Record Examination.

Required: the general requirements, pages 91–99. Master of Sciences degree candidates must include in their program of study Geol 141, 163, 205, and 272. Geol 299–300 *Thesis Research* is required. Candidates must pass a Master's Comprehensive Examination before submitting their thesis work. A reading knowledge examination in French, Spanish, German, or Russian must be passed before beginning the thesis work or before beginning the third semester of graduate work; other languages may be taken with permission of the department. With the permission of the department, candidates in the Master of Science program may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)—Prerequisite: a Bachelor's degree with a major in geology or in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 91–99, including Chem 111–12; Geol 141, 241, 249; Chem 213; and Geol 299–300. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Departments of Geology or Chemistry, must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Master of Science in the field of engineering geology—An interdisciplinary degree offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science.

Prerequisite: A Bachelor of Science degree in geology or a Bachelor of Science (Civil Engineering) degree from this University or an equivalent degree which must include those courses or their equivalents as outlined for the undergraduate requirements in the field of geology with the engineering option (engineer-

ing geology). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis. (Students wishing to work toward a Master of Science in the field of geotechnics and foundation engineering should consult the *School of Engineering and Applied Science Bulletin.*)

Required: (a) The general requirements, pages 91–99; (b) geology—at least 12 semester hours to include Geol 128, 141, 163, and 205; (c) engineering and physical science—at least 12 semester hours to be selected from ApSc 211, 213; CE 204, 205, 206, 207, 208, 209, 216, 217, 218, 219, 221, 255, 256, 257, 263, 265, 271, 275, 276; ME 221, 227, 231, 261, 262; EngS 228.

Doctor of Philosophy in the field of geology—Required: the general requirements, pages 91–93, 99–101, including passing a reading knowledge examination in an approved foreign language and one other approved tool subject; and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

Research fields: geomorphology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, structural geology, geochemistry, and hydrogeology.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments)—Required: the general requirements, pages 91–93, 99–101, including passing a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

Bachelor of Arts in Education and Human Development with a teaching field in earth science—Prerequisite: the education curriculum, page 114.

Required: the earth science option and the professional courses listed on page 117.

First Group

1–2 Introductory Geology for Nonscience Majors (3–3) Staff

An introduction, for nonscience majors, to the principle features of the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, continental drift, origin of life, and evolution. Lecture (2 hours), laboratory (2 hours). Laboratory fee, $15 per semester. (Academic year)

5 Environmental Geology (3) Siegel, Staff

The relation of people and society to natural environments; population evolution and mineral resources; economic, legal, and political aspects. Laboratory fee, $15. (Fall and spring)

21–22 Physical and Evolutionary Geology (3–3) Lewis and Staff

Lecture and laboratory (5 hours). Principles of geology as a base for further study in geology and related sciences. Laboratory fee, $15 per semester. (Academic year)

Second Group

101 History of Geological Sciences (3) Teleki

Development of scientific thought; history of geological and related sciences. (Spring)

105 Geological Hazards in Land-Use Planning (3) Siegel
An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 5 or 21, or permission of instructor. Laboratory fee, $10. (Spring)

110 Mineralogy and Petrology for Environmental Sciences, Oceanography, and Fields Allied to Geology (3) Carroll
Lecture and laboratory. Prerequisite: permission of instructor. Laboratory fee, $10. (Spring)

111 Mineralogy (4) Carroll
Lecture and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1 or 21. Laboratory fee, $15. (Spring)

112 Crystal Optics (4) Carroll
Lecture and laboratory. Optical phenomena of crystals and uses of the polarizing microscope. Prerequisite: Geol 111. Laboratory fee, $18. (Fall)

113 Crystallography (3) Appleman
Point-group and space-group theory, fundamentals of crystal structure, x-ray diffraction theory and application. Prerequisite: Math 31. Laboratory fee, $15. Academic year 1980-81 and alternate years.

117 Petrology (2) Lewis
Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes; volcanic processes and products. Prerequisite: Geol 21, 111–12; Phys 1 or equivalent; or permission of instructor. (Spring)

118 Petrology Laboratory (2) Lewis
Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111. Laboratory fee, $18. (Spring)

122 Structural Geology (3) Stephens
Interpretation of geologic formations on basis of their structures. Prerequisite: Geol 22. (Fall)

123 Structural Geology Laboratory (1) Stephens
Solution of geometrical problems of structural geology. Prerequisite or concurrent registration: Geol 122. Laboratory fee, $10. (Fall)

125 Marine Geology (3) Pierce
Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. (Spring)

128 Geomorphology (3) Stephens
Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 21. Laboratory fee, $15. (Spring)

132 Economic Geology (3) Turner
Genesis and distribution of mineral raw materials and their uses. Prerequisite: Geol 111. (Fall)

136 Engineering Geology (3) — Geiger

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or permission of instructor. (Spring)

141 Introductory Geochemistry (3) — Siegel

Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisites or concurrent registration: Geol 117 or equivalent; Chem 11–12; Math 30; Phys 1 or 3; or permission of instructor. Laboratory fee, $5. (Fall)

151–52 Invertebrate Paleontology (3–3) — Coates

Lecture and laboratory (5 hours), field trips as arranged. A systematic treatment of the invertebrate fossil groups, emphasis on the macroinvertebrates. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. Laboratory fee, $15 a semester. (Academic year)

154 Vertebrate Paleontology (3) — Hotton

Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. Alternate academic years. (Fall)

158 Micropaleontology (3) — Sohn

Systematic and stratigraphic studies of important microbiota; subsurface methods. Special topics. May be repeated for credit with permission of instructor. Laboratory fee, $12. Alternate academic years. (Spring)

163 Sedimentation (4) — Lindholm

Lecture (2 hours), laboratory (4 hours), field trips as arranged. Principles of sedimentation, analysis and interpretation of sedimentary processes and environment, laboratory experiments in the properties of sedimentary particles. Prerequisite: Geol 111, 112, or permission of instructor. Laboratory fee, $15. (Fall)

166 Principles of Stratigraphy (3) — Coates

Stratigraphic principles and methods. Prerequisite: Geol 151 or permission of instructor. (Fall)

175 Hydrogeology (3) — Back

The occurrence, storage, movement, quality, and problems of pollution of subsurface water, and the hydrologic properties of water-bearing materials. Prerequisite: Geology 111, 122; Math 31; Chem 11–12; or permission of instructor. (Spring)

181 General Oceanography (3) — Maloney

Chemical and physical properties of sea water, movements of water masses, meteorological interrelations, ecology of marine plants and animals. Prerequisite: Math 31 or equivalent, or permission of instructor. Alternate academic years. (Spring)

189 Geophysics for Geologists (3) — Stephens

Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 21–22, Math 31, Phys 1 or 3; or permission of instructor. (Fall)

195 **Field Work** (2) Staff
Weekend field trips. Surveying, geological mapping, and specific field work methods. (Spring)

199 **Undergraduate Research or Reading** (arr.) Staff
Problems approved by the staff. May be repeated once for credit. (Fall and spring)

Third Group

205 **Seminar in Geology** (1) Staff
Special topics each semester. May be repeated for credit.

216 **Sedimentary Petrography** (3) Lindholm
Identification, classification, and interpretation of common sedimentary rocks by means of the petrographic microscope. Prerequisite: Geol 111, 112, 163; or permission of instructor. Laboratory fee, $15. (Spring)

219 **Petrogenesis I** (3) Lewis
The origin of selected igneous and metamorphic rock types. Laboratory fee, $15. (Fall)

220 **Petrogenesis II** (3) Lewis
Laboratory fee, $15. (Spring)

224 **Advanced Structural Geology** (3) Lewis
Rock deformation. Methods of study and the formation of structurally complex rock. Tectonics. Prerequisite: Geol 122 or permission of instructor. Academic year 1980-81 and alternate years. (Fall)

241 **Marine Geochemistry** (3) Siegel
Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, and permission of instructor. Recommended: Chem 22. Laboratory fee, $18. (Spring)

243 **Geochemical Prospecting** (3) Siegel
Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geology 141. Laboratory fee, $15. (Spring)

249 **Seminar: Geochemistry** (2) Siegel
Independent topics each semester; may be repeated for credit. (Fall or spring)

253 **Paleoecology, Biogeography and Paleoclimatology** (3) Coates and Staff
Concepts and methods in identifying bioassociations and their environments. Academic year 1980-81 and alternate years. (Fall)

254 **Evolutionary Paleobiology** (3) Staff
Consideration of modern evolutionary theory with emphasis on the fossil record. (Spring—alternate academic years)

255 **Quantitative Paleoecology** (3) Buzas

Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, size-frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151–52, Stat 91; or permission of instructor. Alternate academic years. (Fall)

258 **Micropaleontology** (3) Staff

Systematic studies of important microbiota. Prerequisite: Geol 158 or permission of instructor. Alternate academic years. (Fall)

263 **Sedimentary Environments** (3) Lindholm

Study of selected depositional environments. Field trips as arranged. Prerequisites: Geol 163; Stat 91. Alternate academic years. (Fall)

266 **Stratigraphy** (3) Coates and Staff

Problems in physical and biological stratigraphy. Analysis of major facies types. Alternate academic years. (Spring)

272 **Regional Geology** (2) Carroll

295 **Research** (arr.) Staff

Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King, K. Thoenelt, C. Steiner *(Chairman)*
Assistant Professorial Lecturer P. Werres
Lecturers L. Melbourne, U. Rourke

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 74, 81–87.
2. **Prerequisite courses—Ger 1–2, 3–4, 9–10, 51–52; or equivalent.**
3. Required courses in other areas—six semester hours of history, and six semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179 80; reasonable proficiency in speaking, reading, and writing German.

Minor in German—Required: 12 semester hours of second-group courses, including Ger 179–80 and one two-semester course in German literature taught in German. Prerequisite: Ger 1–4, 9–10, 51–52, or equivalent.

Master of Arts in the field of Germanic languages and literatures—Prerequisite: a Bachelor of Arts degree with a major in Germanic languages and literatures from this University, or an equivalent degree.

Required: the general requirements, pages 91–99, including a reading knowledge of French. The program of study consists of (1) 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) in the field of German literature or linguistics or, with departmental approval, (2) 30 semester hours of approved course work without a thesis.

Bachelor of Arts in Education and Human Development with a teaching field in German—Prerequisite: the education curriculum, page 114.

Required: the German option and the professional courses listed on page 118.

The Germanic Languages and Literature Department, through the Consortium of Universities of the Washington Metropolitan Area, Inc., cooperates in a program leading to the degree of Doctor of Philosophy at Georgetown University.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

GERMAN

First Group

1–2 First-year German (3–3) — Staff

Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 2: Ger 1. (Fall and spring)

***3–4 Second-year German** (3–3) — Staff

Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3. (Fall and spring)

***9–10 German Conversation and Composition** (3–3) — Staff

(Academic year)

47 Beginning German for Reading Acquisition (3) — Melbourne

For undergraduates and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

49 German Readings for Nonmajor Students (3) — Melbourne

Primarily for graduate students preparing for reading examinations, undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4 or 47, or equivalent. (Spring)

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* With permission of instructor, Ger 9 or 10 may be taken concurrently with Ger 4.

51–52 **Introduction to German Literature—in English** (3–3) Staff

Lecture, recitation, and discussion. Selected readings in German literature from the earliest periods to the present. (Academic year)

Second Group

103–4 **Major Themes of German Literature—in English** (3–3) Thoenelt

Lecture and discussion. Topics for 1980-81: Ger 103—the "Faust" theme in German thought and civilization, from Goethe to Thomas Mann; Ger 104—the anti-Faust movement in German thought and civilization. Central topics: Jean Jacques Rousseau's return to nature and progress; "Realpolitik" and the arts and letters; "Kultur" (self-realization), the "Bildungsroman" and technocracy. (Alternate academic years)

111–12 **Comparative Studies in Germanic Literatures—in English** (3–3) Thoenelt

Lecture and discussion. Topics for 1981-82: Ger 111—Absurdity and rebellion, loss and rediscovery of the self, changing Gestalt concepts, from Existentialism back to Enlightenment, selected works of Thomas Mann, Böll, Frisch, Hesse, Strindberg, Goethe and others. Ger 112—Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. From Plato to the 20th century. Selected works and excerpts from Plato, Aristotle, Horace, Shakespeare, Montaigne, Goethe, Schiller, Heine, Nietzsche, Thomas Mann, Sartre, Camus, Böll and others. (Alternate academic years)

126 **France and Germany—in English** (3) Thoenelt

Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. (Summer)

131–32 **18th-Century German Literature—in German** (3–3) Thoenelt

Enlightenment, Storm and Stress, Classicism. Reading, lecture, and discussion. Central topic: *Geist und Tat*—or the 18th-century concept of literature's formative function in society. (Alternate academic years)

141–42 **19th-Century German Literature—in German** (3–3) Steiner

Romanticism, Biedermeier, young Germany, poetic realism. Second age of chivalry and *Sehnsucht*, revolution and counter-revolution in thought and literature. Birth and growth of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture and discussion. (Alternate academic years)

151–52 **20th-Century German Literature—in German** (3–3) Steiner

The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hesse; émigré literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. (Alternate academic years)

161–62 **Studies in Modern German Literature—in English** (3–3) Steiner

Readings of representative writers of modern German prose; lecture and discussion in English. Offered as the demand requires.

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt
Discussions and compositions on literary and cultural topics, readings of newspaper articles, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammar and style studies. (Alternate academic years)

Third Group

201–2 **Middle High German** (3–3) King
(Alternate academic years)

209–10 **German Expression and Style in Historical Perspective** (3–3) King
(Alternate academic years)

211–12 **History of the German Language** (3–3) King
(Every third academic year)

213–14 **Old Norse** (3–3) Allee
(Alternate academic years)

225–26 **Seminar: Linguistics** (3–3) King, Allee
Bibliography, methodology, readings, and research problems. Offered as the demand requires.

231–32 **German Classicism** (3–3) Thoenelt
Advanced study and critique of the literature of the Goethe era. The 18th-century image of man; literature and society; the regenerative function of aesthetics; and the establishment of criteria for "Kunst" and "Kitsch." (Alternate academic years)

251–52 **Seminar: Studies in 20th-Century German Literature** (3–3) Steiner
Special projects in fiction, drama, poetry, and criticism. Topic for 1980–81: *Das deutsche Drama der Gegenwart*. Analysis of *Weltanschauung* and themes in the major dramatic works of Brecht, Dürrenmatt, Frisch, Grass, Hochhuth, Peter Weiss and others. (Alternate academic years)

271–72 **Seminar: German Realism** (3–3) Steiner
Analysis of authors, work, genres, and literary trends. Topic for 1981-82: *Kritik und Aufbruch*. Investigation of German sociocritical literature from Lessing to Peter Handke. (Alternate academic years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

SANSKRIT

105–6 **First-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Alternate academic years)

107–8 Second-year Sanskrit (3–3) King

A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural-oral practice in language laboratory. Prerequisite: Ger 105–6 or equivalent. Laboratory fee, $17.50 per semester. (Alternate academic years)

GREEK

See **Classics.**

HEALTH SERVICES ADMINISTRATION

Professors L. Gintzig, M.C. Devolites, K.J. Darr, P.N. Reeves *(Chairman)*
Adjunct Professors P.D. Nelson, W.J. Auton
Professorial Lecturers H.L. Hirsh, C.C. Rorrie, M.A. Gonyea, M.E. Schoeman
Associate Professors P.S. Birnbaum, R.G. Shouldice, R.F. Southby
Adjunct Associate Professor S.T. Fisher
Associate Professorial Lecturers H.R. Wertlieb, C.V. Gordon, N.B. Hadley, M.M. Reynolds, A.J. Singh
Assistant Professors D.F. Bergwall, S.D. Lind, G.E. Crum, C.P. McKelvey
Adjunct Assistant Professors J.E. Montgomery, D.F. Eversmann, H.C. Coffey, P.T. Bruder, C.B. Smiley, Jr., M. Meyer, M.J. Dooling, D.L. Hagengruber
Assistant Professorial Lecturers R.H. Hagaman, M.G. Bromley, M.M. Barch, M.R. Knowles
Adjunct Instructors J.P. Kelly, C. Henderson III, P.L. Knight, W.W. Knox, J.E. Clair, W.F. Leadbeater, M.J. Benson

George Washington University offers undergraduate study leading to the degree of Bachelor of Science in Health Care Administration. The primary purpose of this bachelor's degree program is to provide students with a broad **managerial education for mid-level administrative and planning positions in** hospitals and related health organizations. At this time the degree program is limited to students in the Naval School of Hospital Administration at Bethesda, Maryland; for further information contact the chairman of the Health Services **Administration Department.**

Programs of study leading to the degrees of Master of Health Services Administration† and Post-masters Graduate Certificate in Health Services Administration, and areas of concentration in health services administration in programs leading to the degrees of Doctor of Business Administration and Doctor of Public Administration, are offered by the School of Government and Business Administration (see pages 134–64).

Second Group

Second-group courses marked with an asterisk (*) are limited to students in the Bachelor of Science in Health Care Administration degree program at the Naval School of Hospital Administration.

† Accredited by the Accrediting Commission on Education for Health Services Administration.

*108 **Survey of Health Economics** (3) Benson

Survey of the principles and applications of economic analysis in the health field. Economic criteria required for cost effectiveness, operations analysis and resources management.

*110 **Introduction to Health Care Planning** (3) Dooling

Introduction to health care program and facility planning. Emphasis on the role and function of planning agencies, estimation of needs, assessment of community and facility resources, data collection and evaluation of program and facility design.

*120 **Personnel Relations in Health Care Institutions** (3) Bruder

Introduction to personnel relations in the health care environment. Research studies, as they pertain to leadership and superior-subordinate relations in a multidisciplinary organization, are evaluated for practical application. Emphasis on employee cooperation, differences in ability and background, and particular problems caused by specific working conditions.

*130 **Hospital Labor Relations** (3) Leadbeater

Brief history of unionism, characteristics of union organizations and union movements, and the basic reasons why the government became involved in employer-employee relations. Labor laws and National Labor Relations Board decisions as applied to health care facilities. Management's role in the collective bargaining process and the administration of and "living" with collective bargaining agreements.

*140 **Hospital Financial and Material Management** (3) Kelly

Principles, practices, functions and objectives of financial and material management of hospital operations; emphasis on the role and contributions of middle management. Costs and budgetary control, responsibility accounting, cost-based budgets, purchasing, inventory control, distribution and storage.

142 **Financial Management in Health Care Institutions** (3) Clair

Consideration of the nature, analysis and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process

153 **Survey of Health Care Organization** (3) Clair

Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall and spring)

154 **Introduction to Hospital Management and Procedures** (3) Coffey, Clair

Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager. Prerequisite: HSA 153 or consent of instructor. (Fall and spring)

*155 **Special Problems in Health Care Management** (3) Knox

Supervised reading program in which the student is expected to review the literature on a middle-management problem present in contemporary American health care institutions.

*159 **Legal Issues in Health Care Administration** (3) Smiley

Recognition and comprehension of areas of legal liability in hospital activities. Knowledge and understanding of a wide variety of administrative duties and responsibilities of a legal nature, such as administrative investigations, misconduct and line-of-duty determinations, administrative discipline and discharge, claims under the Medical Care Recovery Act, Federal Tort Claims Act, and other related matters.

*162 **Introduction to Hospital Information Systems** (3) Knox

Development and discussion of a computerized integrated information system, its effect on the environment and its use within the organizational system for planning and control. Analysis of actual information systems used in hospitals.

170 **Quantitative Methods in Health Care Administration** (3) Montgomery

Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas.

*180 **Management Case Problems in Hospital Administration** (3) Meyer

Management functions in the hospital setting. Management case problems in hospital administration areas such as authority relationships, communication barriers, motivation and productivity, and control techniques discussed and analyzed.

190 **Special Topics in Health Care Administration** (3)

Experimental offering at the undergraduate level. (Fall and spring)

Third Group

202 **Introduction to Health and Medical Care** (3) McKelvey, Crum, Knowles

(Formerly Introduction to Health Care Systems)

Lecture and discussion (2 hours), laboratory (2 hours). Examination of the nature of health and disease using biomedical, epidemiological, and ecological models. Description and analysis of resource, process, and control components involved in delivering services—technology, manpower, patients, delivery mechanisms, and assessment and allocative mechanisms. Survey of selected disease problems and their impact on management and planning. Medical terminology. (Fall and spring)

203 **Organization and Management of Health Services** (3) Shouldice, Hadley, Hagaman

(Formerly Organization and Management of Health Services Institutions)

Application of management theory and concepts to health services systems and institutions. Characteristics, functions, and organizational structures of delivery systems. (Fall and spring)

207 **Program Evaluation in Health Services** (3) Lind
(Formerly Management Analysis in Health Care Institutions)
Basic investigatory techniques used to conduct, as well as to assess and interpret, evaluation of health services programs. Includes information systems and data collection, analyses, and reporting. Introduction to computer applications. (Fall and spring)

208 **Quantitative Methods in Health Services Operations** (3) Devolites, Singh
(Formerly HCA 211)
Concepts and application of quantitative methods in health services operations, involving biostatistics, demand analysis and forecasting, resource allocation, and quality and productivity control. (Fall and spring)

209 **Health Resources Management I** (3) Devolites, Birnbaum, Gonyea
Introduction to health resource management and funds administration for health services institutions and agencies. Preparation of budgets, financial statements, and reports. Financial analysis. Management of plant and equipment. Regulation and containment of costs. Safeguarding assets. (Fall and spring)

210 **Health Resources Management II** (3) Southby
(Formerly Advanced Health Resources Management)
Study of health manpower, development, allocation, and utilization. National health expenditures. Review of micro- and macroeconomic principles as they apply to health services programs. (Fall and spring)

212 **Introduction to Health Planning** (3) Bergwall, Rorrie, Crum
Introduction to the history and development of government health planning programs in the United States. Basic health planning methods and procedures useful at a project or institutional level. The generic planning process; mechanisms for plan implementation. (Fall and spring)

215 **Health Services and the Law** (3) Hirsh
(Formerly HCA 287, Health Care Administration and the Law)
The sources of law and the legal processes affecting the health services system. Elements of administrative law and agency processes. Introduction to the legal relationships, e.g., torts, contracts, and insurance, of facilities, physicians, personnel, and patients. Legal aspects of labor relations, and trends in health services delivery law. (Fall and spring)

221 **Health Systems Planning** (3) Reeves, Schoeman
(Formerly HCA 214)
Application of advanced quantitative and rational methodologies for planning health systems. Discussion focuses on a selected sequence of critical components in the health planning process. Prerequisite: HSA 208 and 212 or permission of instructor. (Fall)

223 **Seminar: Policy in Health Planning** (3) Southby, Crum
(Formerly HCA 216)
Effects of legal, political, social, and economic factors in health planning, with emphasis on local policy formulation, analysis, and implementation. The role of local health policy as an expression of community values. Prerequisite: HSA 212 or permission of instructor. (Spring)

225 **Developing National Health Services Policy** (3) Darr
(Formerly HCA 289, Seminar: Developing National Health Care Policy)

Understanding and analyzing the processes by which health services policy is formulated and implemented at the federal level. Focus on Congress, the presidency, and the agencies. (Fall)

227 **Seminar: Ethics in Health Services Administration** Darr
(Formerly HCA 291, Seminar: Health Care Ethics)

Investigating moral and ethical problems confronting the health services system. Understanding the legal, social, and policy implications of issues in medical and health services delivery such as: administrative and institutional ethics, professional codes, impaired professionals, death, fertility control, experimentation and new technology, and resource allocation. (Spring)

231 **Managing the Short-Term Hospital** (3) Darr, Barch
(Formerly HCA 205, Hospital Administrative Practices)

Lecture and discussion (2 hours), laboratory (2 hours). Organization, management, and interrelationships of hospital clinical, support, and administrative departments. Analyses of procedures and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HSA 203 and Mgt 207, or permission of instructor. (Fall and spring)

233 **Delivery of Mental Health Services** (3) Reynolds
(Formerly HCA 250)

Study of the organizations and systems for delivery of mental health services; emphasis on management and financing treatment and rehabilitation facilities. (Fall and spring)

236 **Introduction to Long-Term Care Administration** (3) Wertlieb
(Formerly HCA 260)

Evolution of long-term care as a health care delivery subsystem. Comparative evaluation of characteristics of various types of institutions and programs. Government regulation. Relationships between the purposes and functions of these institutions and programs and the health care needs of the community are investigated. (Fall)

237 **Managing the Long-Term Institution** (3) Wertlieb
(Formerly HCA 261, Seminar: Managing the Long-term Care Institution)

Organization and management of nursing homes, personal and residential care facilities, and institutions for other populations needing long-term specialty treatment. Emphasis on personal and professional skills necessary to provide a wide range of services and quality care in these environments. (Spring)

238 **Ambulatory Health Services Management** (3) Shouldice
(Formerly HCA 240, Ambulatory Health Care)

Introduction to the organization and management of ambulatory care. Presentation of models, financing mechanisms, institutional affiliations, estimating and planning for ambulatory care, and the use of solo and group practice of medicine as part of a total system of services delivery.

239 **Management of Health Maintenance Organizations** (3) Shouldice
(Formerly HCA 204)

Basic principles and fundamentals of prepaid group practice and health maintenance organizations. Emphasis on planning, development, and operation of HMOs, including discussion of models, financial issues, consumers, and providers of care. (Spring)

245 **Case Studies in Health Services Administration** (3) Devolites, Birnbaum, Southby
(Formerly HCA 206)

Discussion (2 hours), laboratory (2 hours). Intensive qualitative and quantitative analyses of major problem areas in health system management and planning using the case study method. Cases cover the broad spectrum of health policy, planning, and operations of the health services system. Serves as a capstone course for health services management students. (Fall and spring)

252 **Comparative Health Services Systems** (3) Gintzig
(Formerly HCA 213)

Evaluations of various organizational patterns, functions, and trends in international health services delivery systems. Emphasis on sources of such differences and significance of the systems to the health status of a nation. Primarily for advanced students, open to others by arrangement. (Spring)

255 **Issues in Gerontology** (3) Lind
(Formerly HCA 267, Issues in Aging)

Interdisciplinary seminar on the nature and problems of aging, including social, psychological, biological, economic, demographic, health, and service needs of the older population. Introduces theory and research, and explores attitudinal and behavioral components based on contact with older persons. Discussion of reactions to aging. (Fall and spring)

270 **Research in Health Services Administration** (3) Reeves

Field research. Primarily for advanced students; open to others with consent of instructor. May be repeated for credit. (Fall and spring)

271 **Field Problem Studies in Health Services Administration** (3) Crum
(Formerly HCA 288)

Work experience guided by a qualified preceptor on selected management and planning issues and problems occurring in health services facilities, programs, and agencies. Primarily for advanced master's and doctoral students; open to other students by arrangement. May be repeated for credit. (Fall and spring)

273–74–75 **Residency I** (3–3–3) Staff
(Formerly HCA 293–94–95)

Twelve-month residency. Work experience guided by a qualified preceptor; periodic written progress reports and a written major report or selected field projects are required. (Fall and spring)

276–77–78 **Residency II** (3–3–3) Staff
(Formerly HCA 296–97–98)

For students who take additional residency experience. (Fall or spring)

285–86 **Readings in Health Services Administration** Reeves and Staff
Supervised readings in special areas of health services management and in policy and planning. Primarily for advanced students; open to others by arrangement. May be repeated for credit. (Fall and spring)

290 **Special Topics in Health Services Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated for credit. (Fall or spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to the other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

398 **Advanced Reading and Research** (arr.) Staff
Limited to doctoral students preparing for the general examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

HEBREW

See **Classics.**

HISTORY

Professors R.H. Davison, R.B. Thompson, R.C. Haskett, R.P. Sharkey, H.M. Sachar, R.W. Kenny, P.P. Hill, L.G. DePauw, R. Thornton, L.G. Schwoerer *(Chairman)*, P.F. Klarén
Adjunct Professor R.P. Multhauf
Professorial Lecturers S. Shaloff, A.B. Davis
Associate Professors C.J. Herber, W.R. Johnson, R.A. Hadley, A.D. Andrews, R.E. Kennedy, Jr., J.O. Horton, L.P. Ribuffo
Adjunct Associate Professors A.L.K. Nelson, L.J. Lear

Bachelor of Arts with a major in history (field-of-study or departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying **the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)**

2. Required introductory courses—Hist 39–40, 71–72, or equivalent. Majors may waive one or more of the prerequisite courses by passing departmental examinations, by attaining scores of 600 or above on the College Entrance Examination Board Achievement Tests, or by good performance on Advanced Placement Examinations. Credit for one or more of the prerequisite courses may be received by superior performance on departmental or Advanced Placement Tests. The Department does not accord either waiver or credit by CLEP examination.

3. Required courses in related areas—(a) either 12 semester hours of an approved foreign language or (b) nine semester hours in statistics (Stat 53, 105, and 97).

4. (a) *Field-of-study major*—Hist 199 (Proseminar), six semester hours of third-group courses, including at least three semester hours of research seminar, and the passing of the major examination in the senior year. In planning a program, the student, under the guidance of an advisor, should choose courses which will provide a broad understanding of diverse chronological and geographical aspects of the human experience.

(b) *Departmental major*—27 or more hours of second- and third-group courses, including Hist 199, six semester hours of third-group courses, including at least one research seminar, and six semester hours chosen from each of the following fields: I (Europe)—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 136, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 198; II (United States)—Hist 128, 129, 137, 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 197, 198; III (Russia, Asia, Africa and Latin America)—Hist 102, 107, 108, 116, 119, 135, 143, 145, 146, 158, 161, 162, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196.

A pamphlet relating to the major is available in the offices of the dean of the Columbian College of Arts and Sciences and in the History Department.

An Honors Program may be chosen by juniors with satisfactory scholastic records. Application to this program must be made before the beginning of the second semester of the junior year. Students accepted into the program take a three-hour seminar in the second semester of the junior year and complete the research requirements for the history major by preparing the Senior Honors Thesis (Hist 191–92) in the final year of undergraduate study.

Minor in history—Undergraduate students who select a minor in history must ordinarily declare their intention to the departmental advisor no later than the beginning of their senior year. Such students may choose a non-specialized history curriculum, or may concentrate in one area such as ancient history, medieval history, early modern Europe, modern Europe, the Near East, Russia and East Europe, the United States, Latin America, or the Far East, or in one field such as economic, social, intellectual, diplomatic, political, black, or women's history. In each case the program of courses will be planned in consultation with the history advisor. To meet the departmental requirements for a minor, the student must complete at least 15 semester hours in approved courses with a grade of *C* or above. One 3-semester-hour seminar must be included in the program.

Master of Arts in the field of history—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination with the Advanced Test in History and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99. The program of study consists of (1) a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300 *Thesis Research*, or (2) a minimum of 36 se-

mester hours of second- and third-group courses, including at least two research seminars (six semester hours). Hist 201 is required of candidates who have not previously had a course in historiography and historical method. At least six semester hours of each candidate's program must be in third- or fourth-group history courses; a maximum of six may be in approved courses outside the History Department. To receive graduate credit for second-group courses, master's candidates must arrange for extra work with the instructors. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

Master of Arts in the field of history with a concentration in historic preservation—Required: the general requirements, pages 88–96. This 36-hour master's degree program combines courses in United States history and historic preservation. It includes at least 18 hours of U.S. social history, U.S. urban history, man-made America, and the seminar sequence in historic preservation. For other course distribution requirements, see the departmental graduate advisor. Candidates in this program may satisfy the tool requirement by passing an examination in measured architectural drawing.

Master of Arts in the field of classical archeology, classics, and history (an interdepartmental degree program offered by the Art, Classics, and History Departments)—Prerequisite: a bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99. The program of study consists of 24 semester hours of course work (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the Art, Classics, and History Departments; plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

Doctor of Philosophy in the field of history—Required: the general requirements, pages 91–93, 99–101, including the passing of a written examination in two appropriate foreign languages, or one foreign language and an approved tool subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. The major fields include the following: ancient history, medieval Europe, early modern Europe, modern Europe, United States, Latin America, modern Near East, modern Far East, Russia and East Europe. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, historic preservation, etc.) to the chronologically limited fields (e.g., American colonial history, Tudor and Stuart England, etc.). A student may elect one special field outside of the History Department if it is relevant to the program. Students having a special field in historic preservation may satisfy one tool requirement by passing an examination in measured architectural drawing.

Doctor of Philosophy in the field of international relations—See page 366. This degree program combines work in economics, history, and political science.

Bachelor of Arts in Education and Human Development with a teaching field in history—Prerequisite: the education curriculum, page 114.

Required: the history option and the professional courses on page 118.

Course Accessibility: All second-group courses are open to students without history course prerequisites with the exception of Hist 157 and 199.

First Group

39–40 European Civilization in Its World Context (3–3) Staff
Hist 39: Introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: from 1715 to the present. (Academic year)

71–72 Introduction to American History (3–3) Staff
Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present. (Academic year)

***91 East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101–2 History of Revolution (3–3) Thompson
Hist 101: revolution as a theme in world history from ancient times to Luther, Cromwell, and Robespierre. Hist 102: revolution and the revolutionary movement in the age of Marx, Lenin, and Mao. (Academic year)

105–6 History of Science (3–3) Multhauf
Hist 105: from ancient natural philosophy through the 17th-century scientific revolution. Hist 106: from the Industrial Revolution to the 20th-century amalgamation of science and technology. (Academic year)

107 The Ancient Near East and Egypt to 322 B.C. (3) Hadley
Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

108 Greece and the Near East, 359 B.C. to the Second Century A.D. (3) Hadley
Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.

109 Early Aegean and Greek Civilizations to 338 B.C. (3) Hadley
Neolithic background: Bronze age—Minoan, Helladic, and Mycenaean civilizations; classical Greek civilization to the Macedonian conquest (Fall)

110 The Roman World to 337 A.D. (3) Hadley
Prehistoric Italy; rise and decline of the Roman Empire and Latin civilization; cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 Medieval History (3–3) Andrews
Hist. 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D.: Byzantium and Islam at their apogee. Hist. 112: Medieval European

* An interdepartmental course offered by the History, East Asian Languages and Literatures, Economics, Geography and Regional Science, Philosophy, Political Science, and Religion Departments

daily life, institutions, and creative movements to about 1400; the Crusades and the Near East to the rise of the Ottoman Turks. (Academic year)

116 **History of Africa** (3) Shaloff

Survey of political, cultural, and economic development from ancient times to the present. (Spring)

119 **China in the 20th Century: Reform and Revolution** (3) Johnson

Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

121 **The Renaissance in Western Europe** (3) Schwoerer

Study of the economic, political, intellectual, and cultural acceleration in Western Europe, beginning in the Italian city-states and spreading to France, Germany, and England, in the 14th through 16th centuries. (Fall)

122 **The Reformation in Western Europe** (3) Herber

Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

123 **European Intellectual History I** (3) Kennedy

Popular culture; religion and science in the 17th century: the Enlightenment; Voltaire, Hume, Rousseau, Montesquieu, Beccaria, Diderot, Condorcet on religion, history, nature, society, and politics; the intellectural origins of the French Revolution. (Fall, even years)

124 **European Intellectual History II** (3) Kennedy

Intellectual responses to the French Revolution; 19th-century historical approaches to society, religion, economics, biology, ethics, and psycholanalysis: Hegel, Comte, Marx, Darwin, Nietzsche, and Freud; the intellectual origins of Nazism; literary, artistic, and philosophical responses to World War I. (Spring, odd years)

125 **Women in European History** (3) Schwoerer

A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)

127 **Theories of History** (3) Lavine

Joint offering of the History and Philosophy Departments. Major philosophies of history: Judeo-Christian, idea of progress, historicism, Hegelian-Marxist dialectic, cyclical (Vico, Spengler, Toynbee), and social-scientific (Kant, Weber) views. Contemporary problems of historical knowledge. (Fall)

128–29 **War and Society** (3–3) McDonald

How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil-military relations, the development of strategic thought, and to the naval and military influence Britain and America have exerted on each other. Hist 128: from 1776 to 1918. Hist 129: 1919 to the present. (Academic year)

131–32 **History of Germany** (3–3) Herber

Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist 132: from William II to the present. (Academic year)

135 **History of Soviet Intelligence Services** (3) Dziak
The role and impact of intelligence and security operations in Soviet domestic and foreign policy, 1917 to the present. The course examines the literature and problems of Soviet intelligence operations; Tsarist antecedents; Lenin, the Cheka, and the formative years; operations under Stalin; problems of the post-Stalin years; and operations in the Brezhnev era.

136 **Europe in the 20th Century** (3) Sachar
Diplomatic, political, and cultural developments from the turn of the century to the present. (Summer)

137 **U.S.-Soviet Strategic Relations Since World War II** (3) Thornton
Survey of U.S.-Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)

139–40 **World History in the 20th Century** (3–3) Sachar
Diplomatic, political, and cultural factors. Hist 139: from the turn of the century to the Munich settlement of 1938. Hist 140: from the Munich settlement to the present. (Academic year)

141 **History of France I** (3) Kennedy
Old Regime: Louis XIV, demography, peasants, bourgeois, nobles; Church-Protestant-Jewish relations; salons, Enlightenment and *philosophes;* literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)

142 **History of France II** (3) Kennedy
The Revolutionary tradition, and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; dechristianization, Catholic integralism and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)

145 **Imperial Russia** (3) Staff
From the reign of Peter the Great to World War I. (Fall)

146 **Soviet Russia** (3) Staff
The Russian Revolution and Soviet rule to the present. (Spring)

147 **Economic History of Modern Europe** (3) Sharkey
Joint offering of the History and Economics Departments. Economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

148 **The French Revolution** (3) Kennedy
Social, political, economic, and cultural history of the decade of revolution, 1789–1799. Attention to its structural consequences in France and in Europe-at-large. (Summer)

149–50 **European Diplomatic History** (3–3) Davison
Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 **History of England** (3–3) **Kenny**
Development of English civilization and its impact on Western culture. Hist 151: to 1689. Hist 152: since 1689. (Academic year)

153 **Tudor England** (3) **Kenny**
Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485-1603.

154 **Stuart England** (3) **Schwoerer**
Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, socioeconomic, and intellectual developments in England, 1603–1714. (Spring)

155 **History of Modern Ireland** (3) **Kenny**
The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923.

156 **Winston Churchill as War Leader** (3) **McDonald**
Churchill's role—from cavalry subaltern to prime minister—in the British Empire's wars during his lifetime, with special attention to the two world wars.

157 **20th-Century European Diplomatic History** (3) **Sachar**
The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 **Modern Jewish History** (3) **Sachar**
A secular history of the Jewish people from the 18th century to the present state of Israel; emphasis on European political, economic, and cultural influences. (Spring)

161 **Revolution in 20th-Century Latin America** (3) **Klarén**
An examination of the major social revolutions in modern Latin America, especially in Mexico (1910), Bolivia (1952), Cuba (1959), and Chile (1970); their origins, social composition, leadership, and ideology. (Spring)

162 **20th-Century Latin America** (3) **Klarén**
A survey of the main societal trends shaping Latin America in this century, with particular emphasis on such themes as populism, urbanization, reformism, modernization, Peronism, nationalism, Communism, Castroism, the military, and the development process. (Spring, even years)

163–64 **History of Latin America** (3–3) **Klarén**
Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: a problems approach to Latin America, 1820 to the present; thematic emphasis on neo-colonialism, corporatism, liberalism, *caudillismo*, modernization, populism, and revolution. (Academic year)

165 **Latin American and the Industrializing World, 1825–1945** (3) **Klarén**
Examination of the political/diplomatic responses of Latin American

nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries. (Fall)

166 **History of Mexico** (3) Klarén

Focus on Aztec imperialism, the Indian view of the Conquest, landlord/peasant relations, the struggle for independence, the Revolution of 1910; race, caste and class in modern Mexico; the role of the modern Mexican state. (Fall, alternate years)

167 **Man-Made America: The Old Colonial Scene** (3) Haskett

An interpretive tour through the early American landscape, 1607–1750. Heavily illustrated with color slides. (Fall)

168 **Man-Made America: Views of a New Nation** (3) Haskett

An interpretive tour through the early American landscape. 1750–1820. Heavily illustrated with color slides. (Spring)

169 **The American Revolution** (3) DePauw

The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Spring)

170 **U.S. Early National History** (3) Hill

Political, diplomatic, economic, and social history of the early republic, 1789–1828. (Fall)

171–72 **U.S. Social History** (3–3) Horton

Hist 171: daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607–1861. Hist 172: the urban-industrial era from 1861 to present.

173 **Afro-American History** (3) Horton

Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as AmCv 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton

Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as AmCv 174. (Spring)

175–76 **U.S. Political History** (3–3) Haskett

A study of power: who gets what, where, when, and how. Hist. 175, 1763–1865; Hist. 176, 1865–1960. (Academic year)

177 **The Ante-bellum South** (3) DePauw

Investigation of political, economic, intellectual, social, and cultural characteristics of the American South prior to 1860. Special attention to myths associated with the South, ideologies supporting the slave system, and cultural practices among the white, black, and Indian populations. (Fall, alternate years)

178 **Recent U.S. History** (3) Ribuffo

Political, social, and intellectual history from 1890 to the present. (Fall)

179–80 **U.S. Economic History** (3–3) Sharkey

Joint offering of the History and Economics Departments. Economic growth from colonial times to the present. Development of various sectors in the economy and their interdependence. Hist 179: 1607–1865. Hist 180: from 1865 to the present. (Academic year)

181–82 **U.S. Diplomatic History** (3–3) Hill

American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year)

183 **American Intellectual History** (3) Ribuffo

Aspects of social and political theory, religious thought, literary criticism, and popular psychology from the late 19th century to the present. (Summer)

184 **Civil War and Reconstruction** (3) Staff

How the Union and Confederacy organized for war, evolved strategies, and searched for commanders who could win battles and how the war affected ordinary soldiers and citizens. Political, economic, and social consequences of the Civil War. (Spring)

185 **History of Women in America** (3) DePauw

Joint offering of the History Department and the American Studies Program. Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. (Fall)

186 **U.S. Urban History** (3) Gillette

The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)

187 **History of Modern China** (3) Johnson

China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) Thornton

Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)

189 **History of Modern Japan** (3) Sigur

Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

190 **Ethnohistory** (3) Wagner, Humphrey

Joint offering of the Anthropology and History Departments. Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*.

191–92 **Senior Honors Thesis** (3–3) Herber

Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) — Davison
Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)

194 **History of the Modern Near East** (3) — Davison, Sachar
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and institutions; great-power imperialism; crises of Turkish Straits, Suez, Arab-Israeli relations; and other issues. (Fall, odd years)

195 **Traditional Civilizations of China and Japan** (3) — Johnson
Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1800. (Fall)

196 **The Modern Transformation of China and Japan** (3) — Johnson
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)

197 **Oral History and Interview Techniques** (3) — Staff
Joint offering of the History Department and the American Studies Program. Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

198 **Special Topics in History** (3) — Staff
Historical perspectives on great issues of past and present. New topic each semester.

199 **Proseminar: Readings for the History Major** (3) — Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

Third Group

Prerequisite to all third-group history courses: the appropriate second-group preparation and consent of instructor.

201 **History and Historians** (3) — Staff
Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)

203–4 **Research Seminar** (3–3) — Staff
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 **Evolution of Nationalism in Eastern Europe** (3) — Petrov
Formation of national consciousness and emergence of modern East European states after World War I. Developments of the interwar period. Open to qualified undergraduate seniors. (Fall)

206 **Revolution in Eastern Europe** (3) Petrov

Transformations of East European states during World War II. Resistance movements, communization, and national self-assertion in the immediate post-Stalin period. Open to qualified undergraduate seniors. (Spring)

209–10 **Seminar: Topics in Ancient History** (3–3) Hadley

Readings and discussions on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211–12 **Seminar: Medieval History** (3–3) Andrews

Prerequisite: Hist 111–12 or equivalent. Students with working knowledge of Latin may receive research credit. Each semester will focus on a particular area and period, with emphasis on interdisciplinary research techniques. (Academic year)

213 **Issues in Documentary Editing** (3) DePauw

History of and issues in documentary editing. Topics covered include searching, principles of transcription, forms of publication, funding, and use of computerized equipment. Students will apply principles studied to actual documents. (Fall)

214 **Internship in Documentary Editing** (3) DePauw

Study of the practical application of principles of documentary editing by assignment to a documentary history project in the D.C. area. Course includes periodic group class meetings with project editors. Prerequisite: Hist 213 and permission of the instructor. (Spring)

215 **Transformation of the Socialist Community** (3) Petrov

Soviet relations with East European and Asian socialist states from the end of World War II to the Sino-Soviet split. Changes in substance and form in relations among ruling Communist parties. Open to qualified undergraduate seniors. (Summer)

224 **Reading Seminar: European Intellectual History** (3) Kennedy

Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life.

225 **History of Washington, D.C.** (3) Gillette

Joint offering of the History Department and the American Studies Program. The social history of Washington, from village to metropolis, with emphasis on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Field trips.

228–29 **Modern Military and Naval History** (3–3) McDonald

Discussion, readings, and research in 20th-century British and American military and naval history. Special attention to World War I (Hist 228) and World War II (Hist 229). Topics include Anglo-American coalition warfare, and the interaction of strategy, diplomacy, and national policy in both war and peace.

230–31 **Seminar: Strategy and Policy** (3–3) McDonald
Hist 230: A study of the historical development of strategy, and the relationship of military thought to national policy. Hist 231: 20th-century strategic thought. (Academic year)

232 **Comparative Communist Systems I** (3) Wolchik
Joint offering of the History and Political Science Departments. Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik
Joint offering of the History and Political Science Departments. Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. (Spring)

234 **Modern Archives Administration** (3) Peterson*
Open to history graduate students and undergraduate majors. Lectures and discussion on all phases of administering archival materials. Classes at National Archives. Students must enroll before September 1 for October session, before April 1 for June session.

237 **Seminar: Soviet Foreign Policy, 1917-1960** (3) Petrov
Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful co-existence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239–40 **Early Modern European History** (3–3) Schwoerer
Readings, discussion, and research on topics selected from Western European history of the 14th through 17th centuries.

241–42 **Research Seminar: Modern European History** (3–3) Herber
Prerequisite: appropriate preparation and consent of instructor.

245 **Studies in Macrohistory** (3) Thompson
(Formerly Studies in World History)
Topic for 1980: Six major systems in the philosophy of history: Plato, Augustine, Hegel, Marx, Spengler, Toynbee.

246 **Seminar: Modern Russian History** (3) Staff
Discussions, readings, research. Selected topics in the domestic history of modern Russia. (Fall)

247 **The Theory and Practice of Modern Imperialism** (3) Sharkey
Critical analysis of Marxist and non-Marxist theories of modern imperialism in the light of late 19th and 20th century European and American experiences in Asia, Africa, and Latin America. (Fall)

248 **Reading Seminar: Modern European and Near Eastern History** (3) Davison
Admission by permission of instructor. (Spring)

* T. H. Peterson is Director of the Modern Archives Institute.

249 **European Diplomatic History** (3) Davison
Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great powers and their statesmen in the 19th or 20th centuries. Reading knowledge of one language other than English required. (Fall)

251–52 **English People and Institutions** (3–3) Kenny, Schwoerer
Research seminar. Selected topics in the political, social, intellectual, and economic history of England. Each semester will focus upon one time period and special area of interest.

255–56 **U.S.-Soviet Strategic Relations Since World War II** (3–3) Thornton
Seminar designed to develop a conceptual framework for understanding contemporary U.S.-Soviet relations. Readings the first semester; research the second. (Academic year)

261 **Reading Seminar: Topics in 20th-Century Latin America** (3) Klarén
Admission by permission of the instructor. (Fall)

262 **Research Seminar: Agrarian Society and Polity in Modern Latin America** (3) Klarén
Research on the impact of modernity (e.g., foreign capital, immigration, internal migrations, capitalism) on traditional rural society. Admission by permission of instructor. (Spring)

271–72 **U.S. Social History** (3–3) Horton
Discussion seminar on American daily life, institutions, and intellectual and artistic achievements.

274 **Research Seminar: Materials in Afro-American Culture** (3) Horton
Joint offering of the History Department and the American Studies Program. Prerequisite: Hist 173 and 174 or equivalent. (Academic year)

275–76 **U.S. Political and Colonial History** (3–3) Haskett
Research or readings, depending on student interest. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor. (Academic year)

277–78 **Historic Preservation** (3–3) Pearce
Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program. The preservation movement and its literature. Review of current experience, preservation practice, and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. Admission restricted to master's degree candidates in historic preservation program. (Academic year)

279 **Research Seminar: American History** (3) Staff
Admission by permission of instructor. (Summer)

281–282 **Readings/Research in U.S. Diplomatic History** (3–3) Hill
Research or readings, depending on student interest and curricular needs. Hist 281 covers the period 1776-1890; Hist 282, the period 1890-1950. (Academic year)

283–84 **Research Seminar: Recent U.S. History** (3–3) Ribuffo
Prerequisite: six semester hours of 100-level American history courses. (Hist 283—fall)

285 **Research Seminar: Women in the United States** (3) DePauw
Prerequisite: Hist 185 or equivalent. Practical examination of research, writing, and publication problems in the preparation of scholarly articles for feminist and historical journals. (Spring)

286 **Readings/Research in Early American History** (3) DePauw
At the option of the individual student, this course will offer readings illustrating the methods of some of the most highly acclaimed authors working in the field of Early American history today, or a practical exercise in writing a short article intended for publication. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of a chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

288 **History of Chinese Communism** (3) Thornton
Research seminar on selected topics related to China. Emphasis is on developing research methods, concepts, and the preparation of a scholarly paper. (Spring)

289 **Seminar: Modern Japanese History** (3) Sigur
Discussion and research on selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. (Spring)

291 **Seminar: 20th-Century History** (3) Sachar
Research seminar on selected topics.

292 **Israel, Zionism, and the Arab World** (3) Sachar
Research seminar. (Spring)

294 **Seminar: The Modern Near East** (3) Davison
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries concerning countries from the Balkans, through Turkey and the Arab countries, to Iran. (Spring)

295–96 **The Modern Far East** (3–3) Johnson
Research seminar.

297 **Special Topics Seminar** (3) Staff
Open to doctoral and master's candidates and qualified undergraduates. May be repeated for credit. Offered whenever five or more students can be enrolled.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Prerequisite to all fourth-group history courses: the appropriate second-group preparation and consent of instructor.

Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

The University is a member of the Folger Institute of Renaissance and 18th-century Studies. The policies of the Institute are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the History Department.

301–308 **Folger Institute Seminars** (3 each) Staff
Topics will be announced.

342 **Readings in Modern European History** (3) Davison
From the French Revolution to the period following World War I. (Spring)

379–80 **Readings in Economic History** (3–3) Sharkey
Joint offering of the History and Economics Departments. Hist 379: American economic history. Hist 380: modern European economic history. (Academic year)

382 **Readings in American Diplomatic History** (3) Hill
(Fall)

385 **Readings in the History of Women in America** (3). DePauw
Intensive bibliographic and historiographic examination of broad subject areas within which class members have active research interest. (Spring)

386 **Readings in Early American History** (3) DePauw
(Fall)

387–88 **Readings in the History of Sino-Soviet Relations** (3–3) Thornton
A systematic approach to the study of the history and historiography of Sino-Soviet relations. Hist 387: 1917–1949; Hist 388: 1950 to the present.

395–96 **Readings in Modern Far Eastern History** (3–3) Johnson

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen *(Chairman)*, D. Hawkins, J.E. Snodgrass
Adjunct Professor D.C. Paup
Professorial Lecturers E.L. Shafer, R. Anzola-Betancourt, C.A. Troester, Jr.
Associate Professors L.H. George, M.R. Withers, A.L. Dickerson *(Research)*, B.E. Peters *(Research)*

Associate Professorial Lecturers T. Songster, D.L. Edgell, W.M. Kane, D.M Brody
Assistant Professors H. Nashman, N.D. Johnson
Assistant Professorial Lecturers S.Y. Cha, P.G. Davidoff, D.C. Frechtlin T.J. Riegert, V.S. Annand, J.V. Ackerman
Lecturers M.M.H. Ramsay, E.A. Burkhardt, J.J. Goldblatt, W.C. DeMul L.E. McDevitt, C.D. Cox, M. deBoer, M. Elbin, S. Endler, S.A. Kriegsman W. Woodson
Instructors D.C. Park *(Research)*, A. Morris *(Research)*

Programs of study leading to the degrees of *Bachelor of Science in Human Kinetics and Leisure Studies* (opportunity for specialization in elementary and secondary school physical education, dance education, or dance as a performing art) and *Master of Arts in Education and Human Development* (with specialization in adaptive physical education, dance, perceptual-motor development, general physical education, therapeutic recreation, or tourism development and travel administration) are offered by the School of Education and Human Development (see pages 103–34).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

First Group

Credit for HKLS activities courses is not generally recognized for the baccalaureate degree. For students pursuing the B.S. in H.K.L.S., however, credit is accorded for such courses.

Students whose medical examinations indicate the desirability for remedial or restricted activity are assigned to programs especially adapted to their needs. Unless otherwise indicated, all first-group courses are offered both in the fall and spring semesters.

All first-group courses may be repeated with permission of the instructor.

10 Beginning Badminton (1)	Breen
13 Beginning Ballet Technique (1)	Staff
14 Beginning/Intermediate Ballet Technique (1)	Staff
17 Beginning Modern Dance Technique (1)	Staff
18 Beginning/Intermediate Modern Dance Technique (1)	Staff
19 Dance (1)	Staff
20 Beginning/Intermediate Golf (1)	Staff
21 Foil Fencing (1)	Staff
22 Basketball (1)	Staff
24 Volleyball (1)	Staff
26 Tae Kwon Do (Korean) (1)	Staff
27 Beginning Tennis (1)	Staff
28 Intermediate Tae Kwon Do (Korean) (1)	Staff
29 Yoga (1)	Staff

30 **Body Conditioning** (1) — Staff

31 **Roller Skating** (1) — Staff

32 **Beginning Swimming** (1) — Staff

33 **Swimming/Life Saving** (1) — Staff

34 **Intermediate Swimming** (1) — Staff

36 **Springboard Diving** (1) — Staff

37 **Soccer** (1) — Staff

38 **Racketball** (1) — Staff

39 **Handball** (1) — Staff

40 **Squash** (1) — Staff

41 **Team Handball** (1) — Staff

42 **Aerobic Dance** (1) — Staff

51 **Gymnastics** (2) — Staff
Emphasis on apparatus and trampoline.

52 **Modern Dance Technique I** (1) — Staff

53 **Modern Dance Technique II** (3) — Staff
May be repeated for credit.

54 **Intermediate/Advanced Tennis** (2) — Staff
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.

55 **Swimming—Water Safety Instruction** (2) — Staff

56 **Scuba Diving** (2) — Staff
Laboratory fee, $100.

57 **Intermediate/Advanced Badminton** (2) — Breen
(Spring)

58 **Intermediate Ballet Technique** (2 or 3) — Staff
May be repeated for credit.

59 **Team Sports** (2) — Staff
(Fall)

60 **Racket Sports** (2) — Staff
(Spring)

61 **Aquatics** (2–3) — Staff
(Fall)

62 **Conditioning/Weight Training** (2) — Staff
(Spring)

63 **Games and Movement Activities for Children** (2) — Staff
(Spring)

64 **Horseback Riding** (2) Staf
Laboratory fee, amount announced in *Schedule of Classes*.

65 **Skiing** (2) Staf
Laboratory fee, amount announced in *Schedule of Classes*. (Spring

66 **Synchronized Swimming** (2) Staf

68 **Sport Clinics** (2) Staf
Special intensive study and skill development.

Second Group

101 **Physical Education and Sports in Human Resource Centers** (3) Snodgrass
Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum

102 **Movement Education** (3) Snodgrass
Techniques of teaching movement education with emphasis on problem-solving methods for kindergarten and grades 1–6. (Fall)

103 **Professional Foundations and Concepts of Human Kinetics and Leisure Studies** (3) Snodgrass
Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.

104 **Introduction to Travel and Tourism** (3) Davidoff
Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism (Fall)

105 **Introduction to Adaptive Physical Education and Therapeutic Recreation** (3) Morris
Philosophy, methods, and concepts relating to adaptive physical education and therapeutic recreation. (Fall)

106 **Introduction to Dance Therapy** (3) Staff
General survey of dance therapy areas from theoretical and experimental points of view. Exploration of professional opportunities and training. (Fall)

107 **Ethnic Dance** (2) Johnson
Methods and materials of European folk and social forms of dance. Laboratory experiences assigned. (Spring)

108 **Dance Improvisation** (3) Staff
Awareness of body movements, environment, group dynamics, performance and composition through improvisational technique (Fall and spring)

109–10 **Dance Composition** (3–3) Withers
HKLS 109: basic elements and principles of composition. HKLS 110: advanced problems in composition. Prerequisite: HKLS 108 or equivalent. (Academic year)

111–12 Sports Education Technique (3–3) **Staff**
Techniques for teaching individual, dual, and team sports. (Academic year)

113–14 Practicum (3–3) **Staff**
Pre-practice teaching or practical experience in elementary or secondary school physical education; adaptive physical education, dance, or tourism settings. Seminars relating to field experiences. (Academic year)

115 Movement Technique for Theater (2) **Ramsay**
Basic body awareness, sensory awareness, and movement exploration. Analysis of movement and dramatic justification of movement. May be repeated for credit. (Fall)

116 Mime Movement and Theater (2) **Ramsay**
Fundamentals of mime for the beginner. Isolation and illusion exercises. Work with masks, building improvisation and set pantomimes. May be repeated for credit. (Spring)

117 Dance Education (3) **Johnson**
Organizational, methodological, philosophical and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157. (Fall)

118 Special Problems in Dance Composition (1) **Staff**
Work with elements of movement leading to short composition studies. Prerequisite: HKLS 109–10 or equivalent. (Fall and spring)

119 Creative Dance for Children (3) **Withers**
Dance as an expressive art medium for children; concepts, principles, methods and materials. Emphasis given to dance in elementary education with consideration for special education. (Spring)

120 Repertory (1 or 2) **Staff**
Study and performance of dance works. Admission by permission of instructor. May be repeated for credit.. (Fall and spring)

121 Modern Dance Technique III (2 or 3) **Staff**
Intermediate/advanced modern dance. Prerequisite: HKLS 53 or equivalent. May be repeated for credit. (Fall and spring)

122 Methods and Materials for Health Education (3) **Kane**
Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials and evaluation; basic health knowledge. (Fall and spring)

123 Modern Dance Technique IV (2 or 3) **Withers**
Advanced modern dance. Prerequisite: HKLS 121 or equivalent. May be repeated for credit. (Fall and spring)

129 Introduction to Motor Learning (3) **Stallings**
Concepts of motor skill learning applied to the teaching of movement skills. (Fall)

130 Introduction to Motor Development (3) **Snodgrass**
Study of the evolvement and refinement of fundamental movement skills. (Spring)

133 **Student Teaching** (6 to 12) Nashma
Prerequisite: HKLS 113–14 or equivalent. Admission by permissio of instructor. (Fall and spring)

135–36 **Dance History** (3–3) Johnso
Study of dance from antiquity to present; emphasis on cultural sig nificance of dance as art, education, and social behavior. (Aca demic year)

137 **Dance and Movement Analyses** (3) Staf
Concepts and elementary principles of movement analysis with em phasis on effort and shape. (Spring)

138 **Curriculum, Organization and Administration of Physical Education and Athletics** (3) George
Curriculum and administration related to physical education and ath letic programs. Professional ethics. (Fall)

139 **Coaching Behavior** (3) Snodgrass
Study of behavioral patterns and interactions related to individual and team sports. (Spring)

141–42 **Theater Production for Dance** (3–3) Staff
Theory and practicum in technical aspects of dance production, lighting, sound, theater management, costuming, make-up, publicity, promotion, and audiovisual techniques. (Materials to be purchased.) (Academic year)

144 **Choreography** (3) Staff
Solo and group. May be repeated for credit. Prerequisite: HKLS 109-10 or equivalent; HKLS 141–42 recommended. (Fall and spring)

150 **Introduction to Human Anatomy** (3) Stallings
Systematic study of the structure of the human body. (Fall)

151 **Kinesiology** (3) Paup
Analysis of human movement, including mechanical physics, anatomy and physiology. Prerequisite: an approved course in anatomy. (Spring)

156 **Application of Recreational Skills to Contemporary Lifestyles** (3) George
Development of recreational skills; emphasis on local opportunities for recreational activities. Current trends in community recreational development and program planning. May be repeated for credit with permission of instructor. (Fall and spring)

157 **Dance Technique Theory** (3) Withers
Theoretical foundations of dance. Applied principles of kinesiology, analysis and practice of contemporary dance techniques. (Fall)

158 **Safety: Prevention, and Care of Sports Injuries** (3) George
Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

164 **Physiology of Exercise** (3) Paup
The physiological functions of the body and the effect of exercise on

these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

171 **Current Professional Literature and Competencies** (3) Snodgrass
Study of current literature with implications for HKLS specializations; use of library resources and retrieval systems; evaluation of professional competencies. Prerequisite: HKLS 103.

172 **International Experiences** (1 to 6) Staff
Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of advisor and instructor. May be repeated for credit.

175 **Music for Dancers** (3) Staff
Rhythmic theory and analysis; resources in music and accompaniment principles for dance. Prerequisite: basic knowledge of rhythmic theory. (Spring, even years)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler
Same as Educ 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference, and related conference activities.

184 **Workshop** (1 to 3) Staff
Titles announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

187 **Introduction to Sign Language and Deafness** (3) Staff
Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 187 and SpEd 187.

188 **Sign Language and Deafness** (3) Staff
A second course in conversational expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 188 and SpEd 188.

Third Group

202 **Conceptual Basis of Motor Learning** (3) Stallings
Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills. (Fall and spring)

205 **Perceptual-Motor Programs: Diagnostic-Therapeutic Techniques** (3) Stallings
Programs of perceptual-motor therapy and their basic assumptions and diagnostic-therapeutic techniques. (Spring)

230 **Advanced Concepts in Motor Development** (3) Snodgrass
Study and practice in techniques of critical observance and analysis of motor behavior throughout the life span, with special emphasis on period from birth to age eight and on the aged. (Fall)

232 **Current Issues in Elementary School Physical Education** (3) — Snodgrass

Current philosophy, trends, and research; implications for curriculum, instruction, evaluation. (Spring)

239 **Administration of Recreation and Tourism Services for Special Populations** (3) — Hawkins

Development of recreation and tourism opportunities for disabled, elderly, and other special populations; emphasis on administrative competencies in community organization, communications, consultation, program development, evaluation, and fiscal management. (Spring)

240 **Physical Education for the Handicapped** (3) — Songster

Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications. (Fall)

244 **Therapeutic Recreation Practice** (3) — Park

Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, and relationship of therapeutic recreation to total rehabilitation goals. (Spring)

245 **Medical Aspects of Disabilities and Handicapping Conditions** (3) — Hawkins

Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions: implications for programming and facility development as related to therapeutic recreation, adaptive physical education, and other therapies. (Fall)

249 **Tourism, Recreation, and the Quality of Life** (3) — Hawkins

Impact of leisure on cultural development and social values; specific emphasis on psychosocial aspects of tourism and recreation. May be taken for undergraduate credit with permission of the instructor. (Fall)

250 **Administration of Travel and Tourism Services** (3) — Peters

Organization and management concepts, theories, and issues, stressing application of theory through analysis of short case examples drawn from the broader range of the travel and tourism industry.

251 **Theories and Techniques of Leisure Lifestyle Planning** (3) — Annand

(Formerly Leisure Counseling)

Overview of theories and concepts of leisure counseling, leisure education, and total leisure lifestyle planning. Emphasis on methods and techniques of leisure assessments, attitudinal change, and facilitating leisure planning for special populations as well as the general public.

252 **Supervision in Therapeutic Recreation** (3) — Park

(Formerly Group Dynamics, Interpersonal Relationships, and Supervision of Leisure Services)

Roles and functions of supervision in therapeutic recreation and service. Didactic and experiential activities related to problem-solving in supervision. Emphasis on group dynamics and interpersonal communication skills in supervisory responsibilities.

256 **Sports Medicine** (3) Brody
Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries.

260 **Tourism Development** (3) Riegert, Frechtling
Relationship of economic theory and principles to tourism development; applications of economic analysis techniques to the travel and tourism field. (Fall)

261 **Planning for Tourism** (3) Anzola-Betancourt
Integrated planning for travel and tourism organizations, financial and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall)

262 **Tourism Policy Analysis** (3) Edgell
Understanding components of tourism policy, development of tools for tourism policy analysis, and description of tourism organizations in the government and private sector. (Spring)

265 **Sports and Politics** (3) Breen
Methods of political analysis applied to sports policy; comparative approach to the study of the relationships between ideology, economic development, and the types and levels of government involvement in sports policy. (Spring)

270 **Philosophic Foundations of Dance** (3) Johnson
Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism. (Spring)

271 **Dance Reconstruction** (1 to 3) Staff
Recreating the structure and dynamics of movement from dance scores. (Fall and spring)

273 **Advanced Choreography** (3) Staff
Group or solo choreography. Course work includes responsibility for auditions, rehearsals, and presentation in concert. May be repeated once for credit. Prerequisite: HKLS 144 or equivalent. (Fall or spring)

276 **Dance in Society** (3) Johnson
Anthropological aspects of dance; emphasis on current research and literature.

280 **Advanced Workshop** (1 to 3) Staff
Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)

282 **International Experiences** (1 to 12) Staff
May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) Staff
Field work, internship and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 **Advanced Seminar** (1 to 3) Staff
May be repeated for credit with approval of advisor. (Fall and spring)

293 **Independent Study** (1 to 6) — Staff
May be repeated for credit with approval of advisor.

296 **Systems Analysis of Tourism Services** (3) — Shafer
Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall)

297 **Advanced Topical Studies** (3 or 6) — Staff
Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. May be repeated once for credit with permission of the advisor. (Fall and spring)

299 **Thesis Research** (6) — Staff

Fifth Group

701 **Experimental Course** (3) — Staff

721 **Experimental Course—Interdepartmental** (3) — Staff

INSTITUTE FOR SINO-SOVIET STUDIES

Members of the Institute

G. Sigur *(Director)*, C.F. Elliott, A. Gyorgy, H.C. Hinton, W.R. Johnson, Y. Kim, C.A. Linden, G.A. Olkhovsky, V. Petrov, C. Shih, M. Sodaro, R.B. Thompson, R. Thornton, S. Wolchik, R.Y. Yin

Associate Members of the Institute

J. Baclawski, J.J. Dziak, E.M. Hadley, J. Hardt, T. Hsia, W.H. Lewis, B. Ramundo, P.A. Smith, P. True, E.L. Warner

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The Institute for Sino-Soviet Studies offers specialized graduate study in the School of Public and International Affairs. Students who lack background in Soviet and East Asian studies are required to take undergraduate courses selected by the advisor as prerequisite to graduate work. Related preparatory undergraduate courses include the following: Econ 101, 102, 133, 134, 169, 170; Hist 137, 138, 143, 144, 145, 146, 187, 188, 189, 195, 196; PSc 1, 9, 106, 107, 108, 131, 165, 168, 170, 173; Psyc 151.

For description of the objectives and programs of the Institute, see page 182. For description of the courses listed below, see the appropriate departmental listing.

ECONOMICS

267 *Seminar: Soviet Economy* (3) — Hardt
268 *Seminar: Economic Theory and Development in Communist Countries* (3) — Hardt
269 *Economy of Communist China I* (3) — Yin

270 *Economy of Communist China II* (3) — Yin
271 *Economy of Japan* (3) — Hadley

GEOGRAPHY AND REGIONAL SCIENCE

265 *Seminar: Geography of the Soviet Union* (3) — Baclawski
266 *Seminar: Geographic Perspectives on Contemporary China* (3) — True

HISTORY

205 *Evolution of Nationalism in Eastern Europe* (3) — Petrov
206 *Revolution in Eastern Europe* (3) — Petrov
215 *Transformation of the Socialist Commonwealth* (3) — Petrov
*232 *Comparative Communist Systems I* (3) — Wolchik
*233 *Comparative Communist Systems II* (3) — Wolchik
237 *Seminar: Soviet Foreign Policy, 1917-1960* (3) — Petrov
246 *Seminar: Modern Russian History* (3) — Staff
255–56 *U.S.-Soviet Strategic Relations Since World War II* (3–3) — Thornton
288 *History of Chinese Communism* (3) — Thornton
289 *Seminar: Modern Japanese History* (3) — Sigur
295–96 *The Modern Far East* (3–3) — Johnson
387–88 *Readings in the History of Sino-Soviet Relations* (3–3) — Thornton
395–96 *Readings in Modern Far Eastern History* (3–3) — Johnson

POLITICAL SCIENCE

207 *Readings in Socialism and Communism (3)* — Elliott, Linden, Wolchik
208 *Readings in Marxism and Leninism* (3) — Elliott, Linden
230 *Comparative Government and Politics I* (3) — Kim, McClintock
231 *Comparative Government and Politics II* (3) — Kim, McClintock
*232 *Comparative Communist Systems I* (3) — Wolchik
*233 *Comparative Communist Systems II* (3) — Wolchik
263 *Communism in Non-Communist Europe* (3) — Sodaro
264 *The International Politics of Eastern Europe* (3) — Gyorgy
265 *Governments and Politics of Eastern Europe* (3) — Gyorgy
266 *Readings in Soviet Government and Politics* (3) — Elliott, Linden
267 *Soviet Government and Politics* (3) — Elliott, Linden, Wolchik
268 *Soviet Foreign Policy* (3) — Elliott
269 *Soviet Military Policy and Strategy* (3) — Elliott
270 *Politics of the People's Republic of China I* (3) — Hinton
271 *Politics of the People's Republic of China II* (3) — Hinton
272 *Foreign Policy of the People's Republic of China* (3) — Hinton
275 *International Politics of the Far East* (3) — Hinton
276 *Government and Politics of Japan and Korea* (3) — Kim
291 *Colloquium: East Asia* (3) — Hinton
292 *Colloquium: Russia and Eastern Europe* (3) — Gyorgy

* Joint offering of the History and Political Science Departments.

INTERNATIONAL AFFAIRS

See **Public and International Affairs.**

INTERNATIONAL RELATIONS—DOCTORAL PROGRAM

Doctoral Program Committee in International Relations

B.M. Sapin *(Chairman)*, R.M. Dunn, Jr., A. Gyorgy, W.R. Johnson, B. Nimer, B. Reich, P.F. Klarén

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of international relations. (The School of Public and International Affairs offers a Master of Arts degree program in the area of international affairs.) The program is directed by a committee whose members are drawn from the Economics, Political Science, and History Departments. Applicants should have a master's degree in a relevant field.

Required: the general requirements, pages 88–91, 97–99. Each program must include three disciplines and five fields of study. However, in some cases, cohesive and well-integrated programs based on two disciplines may be approved. Specific program guidelines are available from the Graduate School on request.

ITALIAN

See **Romance Languages and Literatures.**

JAPANESE

See **East Asian Languages and Literatures.**

JOURNALISM

Professorial Lecturers F.L. Dennis, H.E. Paine, P. Silberman, C.W. Puffenbarger
Associate Professors R.C. Willson, P. Robbins *(Chairman)*
Associate Professorial Lecturers R.L. Courage, J.P. McGill, E. Rogers, J. Coldsmith, W.L. Lawbaugh, W.R. Fonda, D.A. Sparks, C. Blount, R.R. Mueller, T.O. Cron, D. Haun, B.D. Colen, J.P. Martin, J.R. Fogarty
Assistant Professorial Lecturer T.W. Zito, Jr.

Bachelor of Arts with a major in journalism (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)

2. Prerequisite courses—Engl 51–52 or 71–72; Jour 71–72; PSc 1 and 2 or 2 and 3.

3. Required courses in the major—24 hours of second-group courses in Journalism, including (a) Jour 111, 196, 198; (b) nine semester hours chosen

from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155; and (c) 6 semester hours chosen from Jour 115, 116, 117, 140, 141, 142, 145, 146, 150, 160, 170, 190.

4. Required as a minor area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study.

Recommended electives: Econ 121, 142, 157, 161, 162, 181–82; PSc 110, 111, 112, 114–15, 116, 118, 119, 120, 122; Psyc 115; SpDr 132, 133, 134, 135–36; Stat 53, 97, 105.

Minor in journalism—The student must complete 21 semester hours in journalism, including Jour 71 or 72; Jour 111; one course selected from Jour 115, 116, 117, or 170; and four courses selected from Jour 121, 125, 133, 135, 137, 138, 139, 151, or 155.

Departmental prerequisite: Jour 111 is prerequisite to Jour 125, 133, 135, 137, 138, 139, 190 and 196.

First Group

71–72 Introduction to Mass Communication (3–3) Willson

Jour 71: evolution of newspapers and other media in relation to political, social, and economic life; concept of press freedom. International students who lack knowledge of U.S. history should take Hist 71–72 before taking Jour 71. Jour 72: mass media, problems of contemporary journalism, emphasis on federal government-media relations. (Academic year)

Second Group

111 Reporting (3) Robbins, Colen

Gathering, evaluating, and writing news. Typing required. Laboratory fee, $10. (Fall and spring)

115 Newspaper Editing and Make-up (3) Coldsmith, Taylor

Preparation of news copy, pictures, and other graphic material for publication; evaluation of news; page layouts; newspaper make-up. (Fall and spring)

116 Magazine Layout and Design (3) Paine

Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 Magazine Editing (3) Lawbaugh

The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring)

121 Feature Writing (3) Willson

Free-lancing nonfiction articles, materials obtained through independent investigation. (Fall and spring)

125 Science Writing (3) Staff

Writing science news for the mass media. (Spring)

129 TV News: The Politics of Visibility (3)

Joint offering of the Departments of Political Science, Journalism,

and Speech and Drama. Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. (Fall and spring)

133 **Advanced Reporting: Community News** (3) Puffenbarger
Coverage and writing of local news. (Fall)

135 **Advanced Reporting: Consumer Affairs** (3) Cron
Specialized training in the consumer news field. (Fall)

137 **Advanced Reporting: National Affairs** (3) Silberman
Coverage and writing of federal government news. (Fall)

138 **Investigative Reporting** (3) Puffenbarger
In-depth reporting in selected areas of political, economic, and social affairs. Prerequisite: Jour 133 or permission of instructor. (Spring)

139 **Advanced Reporting: Radio and Television News** (3) Blount
Preparing news and public affairs programs for broadcast media. (Spring)

140 **Photojournalism** (3) Fonda
Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print paper. Laboratory fee, $35. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

141 **Intermediate Photojournalism** (3) Sparks, Haun
Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $35. Prerequisite: Jour 140 or Art 23–24. (Spring)

142 **Advanced Photojournalism** (3) Sparks
Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $35. Admission by permission of instructor. (Spring)

145 **Principles and Problems of Public Relations** (3) McGill, Mueller
Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring)

146 **Government Information** (3) Courage
Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

150 **News Coverage in Washington** (3) Robbins
The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings.

151 **Editorial Writing** (3) Robbins
Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. (Spring)

155 **Critical Writing and Reviewing** (3) Martin
Reviewing and commenting on the arts and entertainment for the mass media. (Fall)

160 **New Directions of Journalism** (3) Robbins
A survey of the impact of fiction techniques on modern nonfiction reportage. Study of selected writers to identify influences and trends.

170 **News Publication Management** (3) Coldsmith
The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 **Internship in Journalism** (3)
Study of a journalistic medium in action by working in a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

195 **Documentary Photography** (3) Battaglia
Joint offering of the Art and Journalism Departments. Historical development of documentary photography. Completion of two projects required. Laboratory fee, $36. Prerequisite: Art 23–24, Jour 140–41, or permission of instructor. (Fall)

196 **Senior Project** (3) Staff
Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval, and filed with the student's advisor in the semester before registration. (Fall and spring)

198 **Law of the Press** (3) Dennis
Freedom of the press, censorship, legislative controls, publication as contempt of court, copyright, newsgathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

199 **Special Topics in Journalism** (3) Staff
Selected topics: writing, editing, graphics, photojournalism, or other aspects of communication. May be repeated for credit.

JUDAIC STUDIES

Committee on Judaic Studies

D.A. Altshuler *(Chairman)*, R.H. Davison, R.G. Jones, T.Z. Lavine, B. Nimer, D. Pollock, B. Reich, H.M. Sachar, M. Ticktin, J.E. Ziolkowski

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see pages 432–33].)

Bachelor of Arts with a major in Judaic Studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.
3. Required courses for the major (30 semester hours):

(a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.

(b) two meaningfully related courses selected from each of two of the following groups: I—Anth 177, 183; Art 111, 112; II—Clas 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 171, 172, 193, 194, 292, 293, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—PSc 177, 178; VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 291, 292.

Students applying for the 90-hour degree program in Judaic Studies must, in addition to meeting the general requirements (see page 83), present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and/or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

LATIN AMERICAN STUDIES

Committee on Latin American Studies

M. Gordon *(Chairman)*, T.F. Carroll, J. Grunwald, R.L. Humphrey, Jr., P.F. Klarén, M. Koch-Weser, C. McClintock, P.A. Musgrove, L. Pérez, J.W. Robb, F.R. Siegel, G. Stuart, C.A. Wagner

Bachelor of Arts with a major in Latin American Studies (interdepartmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Anth 2, Econ 1–2, PSc 1 or 3.
3. Required courses in related areas—Span 1–2, 3–4; or equivalent. (Span 9-10 or equivalent is recommended.)
4. Required courses in the major—(a) Anth 172, 185, or 190; Econ 185; Geog 161; Hist 163–64; PSc 183–84; and six semester hours chosen from Span 151–52, 155–56, 157–58, or other approved courses; (b) 18 semester hours, including an interdisciplinary seminar (287) in one of the following areas: anthropology, economics, geography and regional science, Hispanic literatures, history or political science. The required courses listed in (a) which are in the selected area may be included in computing the required 18 semester hours for (b).

Minor in Latin American Studies—Required: one Latin American course in each of the six member disciplines (anthropology, economics, geography, history, political science, and Spanish-American literature). Two years (or equivalent) of Spanish language is prerequisite.

Master of Arts in the field of Latin American Studies—See the School of Public and International Affairs, pages 173–79.

Candidates for the degree of Doctor of Philosophy may elect Latin American history as an area of specialization in the field of history, Spanish American literature as an area of specialization in the field of Romance languages and literatures, or politics of Latin America as an area of specialization in the field of political science.

Courses Dealing with Latin America:

Anthropology—170, 172, 185, 190, 262, 268, 272, 282, 287
Economics—185, 233, 234, 251–52, 285, 286, 287
Geography and Regional Science—127, 133, 161, 223, 261, 287

History—161, 163–64, 165, 166, 261, 262, 287
Political Science—183, 184, 283, 284, 285
Portuguese—31–32
Spanish—91–92, 151–52, 155–56, 157–58, 197–98, 253, 255, 256, 261, 264, 266, 287

LATIN

See **Classics.**

LITERATURE—INTERDEPARTMENTAL GRADUATE STUDIES

Committee on Interdepartmental Literature Studies

G. Ludlow *(French)*, N.N. Natov *(Slavic)*, J.A. Plotz *(English)*, J.A. Quitslund *(English)*, P.G. Sáenz *(Spanish)*, K. Thoenelt *(German)*

Interdepartmental Literature Studies seeks to provide graduate students in departmental literature programs with a greater understanding and appreciation of the interrelated aspects of Western literatures. The courses offered are under the direction of a committee whose members are drawn from the various modern literature departments within the University.

Courses are offered for Masters (non-thesis) and doctoral candidates in one or more of the following literatures: English, French, German, Russian, Spanish, and Spanish-American. Participating departments have agreed that candidates for graduate degrees may take a maximum of 6 semester hours of course work outside their own department as credit towards their Masters and doctoral degrees. Courses in foreign literatures are conducted in English and/or the foreign language, at the discretion of the instructor. All courses are open to qualified undergraduate students as elective credit when taken outside of the major field. Students should consult with the departmental committee member and the course instructor before selecting courses.

For description of the courses listed below, see the appropriate departmental listing. Course offerings will not be restricted to the present listing.

ENGLISH

125–26 *Elizabethan Verse and Prose* (3–3)	Quitslund
133–34 *The Romantic Movement* (3–3)	Plotz
225–26 *Studies in 16th-Century Literature* (3–3)	Quitslund
233–34 *Studies in the Romantic Movement* (3–3)	Plotz

GERMAN

126 *France and Germany* (3)	Thoenelt
161 *Studies in Modern Literature* (3)	Steiner

ROMANCE LANGUAGES AND LITERATURES

French

135 *Comparative Medieval European Literature* (3)	Cruz-Sáenz
229–30 *Literary Renaissance in Europe* (3–3)	Burks

241 *The Age of Enlightenment in Europe* (3) Ludlo
242 *Novel and Theater in the 18th Century* (3) Ludlo

Spanish

135 *Comparative Medieval European Literature* (3) Cruz-Sáen
137 *The Spanish Civil War and the Creative Artist* Barnet

SLAVIC LANGUAGES AND LITERATURES

128 *Dostoevsky: The Man and the Artist* (3) Natov
156 *Leo Tolstoy: His Life and Works* (3) Rowe

MANAGEMENT SCIENCE

Professors R.F. Ericson, G.L. Lippitt, D.D. Roman, P.B. Vaill, J. Harvey, E.B. Adams
Professorial Lecturers T. O'Connor, R.H. Walther, J.F. Coates, Z.A. Shavell
Associate Professors J.F. McCarthy, Jr. *(Chairman)*, R.L. Holland, E.K. Winslow, W.E. Smith, W.W. Hardgrave, J.P. Coyne, E.H. Forman, C.J. Testa, S. Umpleby, E.W. Hahn, W.E. Halal, J. Lobuts, Jr.
Assistant Professor J.D. Frame

Programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Master of Science in Information Systems Technology, Doctor of Business Administration, and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 134–64).

Second Group

107 **Fundamentals of Behavioral Science** (3) Lobuts
Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes which contribute to the functioning of organizations.

118 **Introduction to Information Processing** (3) Smith, Coyne, Forman
Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SGBA computer. Laboratory fee, $25.

119 **Computer Programming for Information Systems** (3) Smith, Testa
COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 97. Laboratory fee, $25

120 **Information Systems Development I** (3) Coyne, Smith
Assessment of the systems concept and its relationship to organizational information decision-making and management. Concepts and techniques involved in the initial development of new or revised

computer-based information systems, e.g., systems analysis and design phases. Prerequisite: Mgt 118, 119; or permission of instructor. Laboratory fee, $25.

121 **Information Systems Development II** (3) Testa, Smith, Coyne

A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 120 or permission of instructor. Laboratory fee, $25.

122 **Special Studies in Information Systems** (3) Smith, Coyne

An independent or group-study project in information systems development which may involve faculty-supervised research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 121 or permission of instructor.

Third Group

200 **Organization and Management** (3) McCarthy, Halal, Adams, Vaill

For designated students in the MBA program. Integrative approach to organizational concepts, management principles, philosophy and theory in public and private organizations. Evolution of management thought, functions, and practices, stressing present management approaches, general systems theory, and contingency management.

201 **Contemporary Issues in Management** (3) Adams, Ericson, Eastin, Brown, Roman, Halal, Loeser, Vaill

(Formerly Advanced Administrative Management)

An advanced management course designed to explore contemporary issues of organizations and management. Current literature and recent research findings will be analyzed. Topics include organizational organic structure and dynamics, strategic planning, impact of information technologies, and creative problem solving. Prerequisite: Mgt 200 or equivalent.

202 **Mathematics and Statistics for Management** (3) Hahn, Forman, Hardgrave

For designated students in the MBA program. Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, regression, and correlation.

204 **Quantitative Factors in Administration** (3) Hahn, Forman, Hardgrave

Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such models. Linear programming, probability, decision-making under uncertainty, queuing and inventory models, simulation. Prerequisite: Mgt 202, 218, or equivalent. Laboratory fee, $10.

207 **Individual and Group Dynamics in Organizations** (3) Lippitt, Harvey, Winslow, Vaill

(Formerly Human Behavior in Organizations)

For graduate students who wish to improve their skills in dealing

with human behavior in organizations. Theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individuals and groups in various organizational settings. Intensive work group experience focusing on theory, research, and group analysis.

208 **Current Issues in Organizational Behavior** (3) Winslow
Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and similar problems. Problems in behavioral science research. Prerequisite: Mgt 207.

210 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow
Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply their learning in various settings and to demonstrate competence in various media. This course emphasizes the relationship between theory and practice. Prerequisite: Mgt 207 or permission of instructor.

212 **Organizational Development: Concepts and Methods** (3) Lippitt, Harvey, Vaill
Primarily for doctoral students. Examination of different concepts of organizational structure, processes, and growth. Models of organizational change will be developed with a taxonomy of methods of initiating action to further organizational development. Prerequisite: Mgt 207, 210; or equivalent. (Fall)

213 **Consultative Processes in Organizations** (3) Lippitt, Harvey
Primarily for doctoral students. Examination through actual practice as well as theory, of the nature of the helping process between one person or group and another person or group. Dynamics of the consulting process will be explored as well as role differences in internal and external consultation. Development of skill in the helping relationship will be furthered. Prerequisites: Mgt 207, 210; or equivalent. (Spring)

218 **Computer Programming with Business Applications** (3) Hahn, Smith, Coyne
For designated students in the MBA program. Basic principles, terminology, and organization of computer systems. Emphasis on developing a proficiency in the use of higher-level programming language via computer solutions to production management and accounting problems. Laboratory fee, $25.

225 **Introduction to Probability Theory and Applications** (3) Hardgrave, Hahn, Forman
Introduction to probability theory and its applications in management science and operations research; foundation course for further study of advanced probabilistic methods in operations research. Sample spaces, conditional probability, common distributions, random variables, simple stochastic processes. Prerequisite: Math 52 or 54, or equivalent.

227 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Hahn
Technical and applied considerations of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of

applications of linear programming. Introduction to integer programming, algorithms, and formulations. Prerequisite: Math 52 or 54, or equivalent. Laboratory fee, $10. (Fall)

228 **Techniques of Operations Research** (3) Hardgrave, Forman, Hahn
Survey and introduction to contemporary operations research techniques, including nonlinear programming, dynamic programming, inventory and queuing models and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 225, 227. (Spring)

229 **Modeling in Applied Operations Research** (3) Hardgrave
Advanced modeling exercises in applied operations research. Prerequisite: Mgt 228 or permission of instructor. (Spring)

230 **Administration of Research and Development** (3) Roman, Frame
Examination of technological, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement and evaluation.

232 **International Research and Development** (3) Roman, Frame
Technological, political, social, and economic factors affecting international R&D policy; problems in industrial, governmental, and international organizations; world technological forecasting; resource allocation; technology transfer. Prerequisite: Mgt 230 or permission of instructor.

233–34 **Technology Assessment Theory and Practice** (3–3) Coates
Mgt 233: the technology assessment concept. Methods for conducting assessments. Management of assessments. Evaluation of selected assessments. Mgt 234: planning and conducting a technology assessment. Prerequisite to Mgt 234: Mgt 233 or permission of instructor. (Academic year)

235 **Technological Entrepreneurship and Innovation** (3) Roman, Frame
The complex decision process in innovation, including choice of technology to develop, evaluation of the state-of-the-art, evolutionary or revolutionary technological change, market appraisal, risk factors, product control, the national and international political and economic environment, and competition. Advantages of technological innovation, how it takes place, and what environmental and operational factors serve as stimulants or barriers.

239 **Seminar: Administration of Research and Development** (3) Roman, Frame
Individual and/or group in-depth research projects dealing with various phases of research and development management. Topic will vary each time the course is offered according to the emerging technology, current operational problems, and student interest. Prerequisite: six to nine semester hours of research and development management or permission of instructor. (Fall)

240 **Survey of Information Technology** (3) Adams, McCarthy
Management-oriented survey of key areas in information technology including hardware, software, systems development, management and the computing milieu. Laboratory fee, $25.

241 **Information Systems Development and Application** (3) McCarth
An advanced course in information technology, emphasizing philos phies, principles, and practices common to the development a application of information systems. Different approaches are studie case study materials are evaluated, and the various roles of t technical staff are considered. Prerequisite: Mgt 118. (Spring)

242 **Comparative Computer Systems** (3) Coyn
Characteristics and capacities of the range of information processin equipment in use today. Recent and prospective equipment a software development. Selection of computers and related softwa and equipment. Prerequisite: Mgt 240 or permission of instructo (Spring)

243 **Management of Information Technology** (3) Adam
Advanced course emphasizing principles, practices, and trends i the management of information technology. Case studies. Prerequi site: Mgt 240, 242; or permission of instructor. (Fall)

244 **Information Systems and Telecommunications** (3) Smith, Forman, Coyn
Principles of telecommunications; applications of telecommunicatio for the transmission of data communications to enhance the flow o information within an organization. Identifying opportunities fo applying technology in ways that will support the efforts of a organization. Terminology, hardware and software considerations and calculations necessary for the specification and design of tele communication systems. Prerequisite: Mgt 118. (Fall)

245 **Data Base Systems** (3) Coyne, Smith, Testa
An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and main tenance; evaluation criteria; standardization of data base systems impact of packaged data management systems; and analysis of the current state-of-the-art in data base development. Prerequisite: Mgt 118. Laboratory fee, $25. (Fall)

246 **Workshop in Data Base Systems** (3) Testa, Forman, Smith, Coyn
Analysis and solution of complex information problems through com mercially available data base systems; development of evaluation methodology, comparison of implementation strategies. "Hands-on" experience with at least four major commercial systems. Prerequisite Mgt 119, 245; Stat 114. Laboratory fee, $25. (Spring)

247 **Higher-Level Programming Languages for Information Systems** (3) Forman, Smith, Coyne
Use of major programming languages in information technology Topics for each language include syntax and semantics, ease of learning, coding and debugging, documentation standards and main tenance, suitability for particular problem areas and projected users availability of languages on large-scale through minicomputers. A comparative analysis of these language and conversion problems is also discussed. Prerequisite: Mgt 118. Laboratory fee, $25. (Fall)

248 **Design of On-Line Information Systems** (3) Coyne, Forman, Smith
Introduction to the analysis, design, and implementation of on-line business information systems. Topics include requirements analysis

functional specifications, file design, man-machine dialogue design, response time requirements, user psychology, human channel and buffer capacity. Prerequisite: Mgt 244; Math 31, 32. (Spring)

249 **Seminar: Information Technology** (3) Adams, McCarthy

Current problems in the design and implementation of computer-supported systems: emphasis on current state-of-the-art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 240, 242, 243; or permission of instructor.

250 **Operating Systems** (3) Hahn

Principles of operating systems; role of the operating system in resource allocation activities inherent in large-scale digital computers. The specialized functions of these systems are defined, and logical requirements of each are specified, including data structuring, multiprogramming, I/O spooling, and job control. As an example of operating systems' capabilities, the Job Control Language of the IBM 370 is described. Prerequisite: Mgt 120, 121. Laboratory fee, $25. (Fall)

251 **Microcomputer Applications** (3) Testa

An in-depth approach to the understanding and use of microcomputer systems. Principles of microcomputers and distinguishing characteristics among various microcomputer systems. Students work individually with the microcomputer system in the laboratory. Prerequisite: Mgt. 122. Laboratory fee, $25. (Spring)

260 **Introduction to General Systems and Cybernetics** (3) Umpleby, Ericson, Adams

Analysis of fundamental general systems and cybernetic concepts evolving in various branches of knowledge and academic disciplines, emphasizing their transcontextual and interdisciplinary nature, e.g. stability, equilibrium, homeostasis, feedback, regulation, equifinality, self-organization, variety, uncertainty, redundancy, paradox, first- and second-order cybernetics, and self-reference.

261 **Fundamentals of General Management Systems and Organizational Cybernetics (GEMSOC)** (3) Ericson, Adams, Umpleby

Dynamics of organization and management from a general systems and cybernetics viewpoint. Translation of GEMSOC research and theory into the world of organizational behavior and management practice. Prerequisite: Mgt 260 or permission of instructor.

263 **Case Studies and Field Research in GEMSOC** (3) Ericson, Adams, Umpleby

Investigation of existing organizational structures and ongoing management processes from a GEMSOC standpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Prerequisite: Mgt 261.

264 **GEMSOC Modeling and Simulation** (3) Umpleby, Adams, Ericson

Literature review and current practice analysis; modeling and simulation exercises. Continuous and discrete representations: system dynamics, set theory, kinematic graphs, information theory. Prerequisite: Mgt 261.

290 **Special Topics in Management Science** (3) Staf
Experimental offering; new course topics and teaching methods. Ma
be repeated once for credit. (Fall or spring)

295 **Managerial Statistics I** (3) Forman, Hahn, Hardgrav
Statistical methods and their applicability to management. Topics in
clude sampling, estimation, hypothesis testing, regression and analysi
of variance. The student will learn how to utilize computer softwar
packages in applying the statistical techniques. Prerequisite: Mgt 20
and 218 or equivalent. Laboratory fee, $25.

296 **Managerial Statistics II** (3) Forman, Hahn, Hardgrav
Statistical modeling of management applications. Topics include mul
tiple regression, analysis of variance, analysis of covariance, survey
design and forecasting. The student will learn how to utilize computer
software packages for statistical modeling. Prerequisite: Mgt 295 o
permission of instructor. Laboratory fee, $25.

298 **Directed Readings and Research in Management Science** (3) Staf
(Fall and spring)

299 **Thesis Seminar** (3) Staf
(Fall and spring)

300 **Thesis Research** (3) Staf
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered a
the demand requires.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An analysis and critique of alternative theoretical frameworks for
describing, understanding, and predicting the nature, values, and
actions of American public and private institutions. Problems, poten
tials, and alternatives for structuring public and private institutions
arrangements to meet the needs of society. (Academic year)

314 **Interpersonal and Group Dynamics** (3) Harvey
A laboratory education course, employing experience-based learning
designed to help participants learn about their impact on others and
the dynamics of small group and intergroup behavior. Prerequisite
Mgt 207, 208, 210, or equivalent, and permission of instructor.

315 **Interdisciplinary Problem Solving in Macro Systems: The Multocular Process** (3) Lippit
Exploration of the utilization of cross-disciplinary representatives
applying a particular problem-solving process when coping with
complex problems. Such problems are defined as those having impact
on large numbers of persons. Students will conduct experiments
using the process, applying it to a real situation, and developing
scenarios. Prerequisite: Mgt 207, 208, 210, 212, or equivalent
and permission of instructor.

325 **Seminar: Statistics and Probability** (3) Hardgrave
Special topics and advanced applications in statistics and probability

such as factor analysis, exploratory data analysis, or Box-Jenkins forecasting. May be repeated once for credit. Prerequisite: Mgt 225 and 295, or permission of instructor.

328 **Seminar: Operations Research** (3) Hardgrave

Special topics and advanced applications in operations research, such as fuzzy set theory, catastrophe theory, or Markovian decision processes. May be repeated once for credit. Prerequisite: Mgt 228 or permission of instructor.

365 **Research Seminar in GEMSOC Theory** (3) Umpleby, Adams, Ericson

Advanced seminar on recent advances in GEMSOC. Examination of the sources of systems concepts in traditional fields; extension of existing theory into new areas. Prerequisite: Mgt 261.

366 **Philosophic and Policy Issues in Institutional Articulation** (3) Ericson

Need for greater institutional coherence of managerial decision-making in an "only one world" frame of reference. Systemic articulation and metasystemic integration: the planned evolution of more effective institutional forms. Institutional sovereignty, organizational morality, and human values: the search for general systemic optimality. Prerequisite: Mgt 261.

390 **Philosophical Foundations of Administrative Research** (3) Lauter, Vaill

Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology, and empirical data. (Fall and spring)

391 **Methodological Foundations of Administrative Research** (3) Lauter

Examination of the process of social science research. Use of models and theoretical frameworks in research: formulation of research questions, hypotheses, operational definitions, research design, sampling methods, and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

May be repeated for credit. (Fall and spring)

MATHEMATICS

Professors D. Nelson, T.P.G. Liverman *(Chairman)*, H. Kenyon, C. Taam, R.L.A. Bari, I. Katz, H.D. Junghenn
Adjunct Professor J. Eftis
Professorial Lecturers D.M. Dribin, A. Thaler
Associate Professors W.A. Smith *(Emeritus)*, D.R.K. Henney, I.I. Glick, M.D. Green, M.P. Lee, E.A. Stone, B. Jamil *(Visiting)*

Associate Professorial Lecturers M.E.I. Morris, C.M. Chambers, P.L. Hay
Y. Akiyama
Assistant Professor M.M. Gupta
Assistant Professorial Lecturers W. Altman, B.F. Rice, M.J. Evans, G.
Federici, M.A. Montemezzi
Lecturers B.E. Gammon, A. Kriegman

Bachelor of Arts or Bachelor of Science with a major in mathematics (d partmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math may be waived upon examination before registration.)
3. Required courses in the major—a minimum of 24 semester hours second-group courses in mathematics, including Math 106, 121, 123, 139 and 1 It is also strongly recommended that students take French, German, or Russi and mathematically related courses in such subjects as physics, statistics, ec nomics and engineering.

Bachelor of Arts or Bachelor of Science with a major in applied mat matics (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math may be waived upon examination before registration.)
3. Required courses in related areas:
   (a) Stat 189–90.
   (b) Eighteen semester hours to be selected, in consultation with the visor, from social and management sciences, engineering and physical scienc or computer sciences. At least 12 semester hours must be chosen from one ar and the other six semester hours must be chosen from courses numbered 101 higher. For courses in applied science, civil engineering, electrical engineeri and computer science, engineering administration, mechanical engineering, a operations research, see the *School of Engineering and Applied Science Bulle*
4. Required courses in the major—a minimum of 24 semester hours second-group courses in mathematics, including Math 111, 112, 139, 140, 181–6 It is also strongly recommended that students take French, German, or Russi

Master of Arts in the field of mathematics—Prerequisite: a bachelor's degr with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. Students must comple 30 semester hours of approved course work, with or without a thesis, and mu pass a comprehensive examination.

Master of Arts or Master of Science in the field of applied mathematics Prerequisite: a bachelor's degree with a major in mathematics or a related fie such as statistics, a physical science, engineering, or economics.

Required: the general requirements, pages 91–99. Course work is divid between mathematics courses and courses from one area of application—e nomics, engineering (civil, computer science, electrical, engineering administ tion, mechanical, or operations research), physics, statistics, or urban a regional planning. Courses in the chosen area of application are selected consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hou of approved course work, including Math 299–300 *Thesis Research*, and mu pass a comprehensive examination. At least 15 semester hours must be mathematics courses, with no more than 6 hours of these from second-gro courses. The remaining courses are chosen from the selected area of appli tion. Theses are jointly supervised by the department of mathematics and t department concerned with the area of application.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than six semester hours from second-group courses. There is no thesis requirement.

Master of Science for Teachers—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31; experience in teaching mathematics at the secondary school level. Required: 30 semester hours of approved second- or third-group mathematics courses, including Math 168.

Doctor of Philosophy in the field of mathematics—Required: the general requirements, pages 91–93, 99–101. The department doctoral program committee, after consultation with the student, will stipulate (1) courses which must be taken to fulfill the 48-semester-hour requirement leading to the General Examination; (2) the two languages, selected from French, German, or Russian, which must satisfy the foreign language requirement; and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the following research fields for the dissertation: functional analysis (abstract differential equations, functional equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, ordinary and partial differential equations, theory of numbers, and topology (general topology, analytic topology, topological groups).

Bachelor of Arts in Education and Human Development with a teaching field in mathematics—Prerequisite: the education curriculum, page 114. Required: the mathematics option and the professional courses listed on page 118.

First Group

***3 College Algebra (3)** — Morris and Staff

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

***6 Plane Trigonometry (3)** — Morris and Staff

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor). (Fall and spring)

***9 General Mathematics I (3)** — Staff

Logic, sets, foundations of the number system, abstract mathematical systems, groups. (Fall and spring)

10 General Mathematics II (3) — Staff

Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices. (Fall and spring)

30 Precalculus (3) — Bari and Staff

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

* The School of Government and Business Administration does not accept credit for this course toward the B.B.A.

31 **Single-Variable Calculus I** (3) Kenyon and Staf
Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent.* (Fall and spring)

32 **Single-Variable Calculus II** (3) Kenyon and Staf
Calculus of trigonometric and hyperbolic functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31. (Fall and spring)

33 **Multivariable Calculus** (3) Kenyon and Staf
Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring

41 **Calculus for Economists I** (4) Jungheni
Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent.* (Fall)

42 **Calculus for Economists II** (4) Jungheni
Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Spring)

†51 **Mathematics for the Social and Management Sciences I** (3) Glick and Staff
Notion of function; graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

†52 **Mathematics for the Social and Management Sciences II** (3) Glick and Staff
Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51. (Fall and spring)

Second Group

101 **Introduction to Mathematical Logic** (3) Nelson
Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall)

102 **Axiomatic Set Theory** (3) Nelson
Zermelo-Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor.

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* Math 30 may be waived as a prerequisite by examination on scheduled dates.
† Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52.

104 Mathematics and Human Thought (3) Dribin

Philosophical and historical aspects of mathematics and its interplay with other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Spring)

106 Introduction to Topology (3) Kenyon and Staff

Prerequisite: Math 139 or permission of instructor. (Spring)

107 Introduction to Algebraic Topology (3) Bari

Prerequisite: Math 122 and 139, or permission of instructor.

111 Mathematics for Engineers and Physicists I (3) Stone and Staff

Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)

112 Mathematics for Engineers and Physicists II (3) Stone and Staff

Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)

113 Graph Theory (3) Bari

Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 Introduction to Abstract Algebra (3–3) Katz

Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 Linear Algebra (3) Lee

Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. Prerequisite: Math 121. (Fall)

124 Introduction to Matrix Theory (3) Junghenn and Staff

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

125 Linear Programming (3) Katz

Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent.

134 Introduction to Boundary-value Problems (3) Gupta and Staff

Prerequisite: Math 111 or 142. (Spring, even years)

135 Projective Geometry (3) Dribin

Prerequisite: Math 123 or 124, or equivalent.

139 Advanced Calculus I (3) Liverman

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall)

140 Advanced Calculus II (3) Liverma

Contraction maps, implicit function and differential equation theo rems. Integration theory. Fourier series. Prerequisite: Math 139 o equivalent. (Spring)

141 Advanced Calculus III (3) Glick and Staf

Tensors, differential forms, Stokes theorem, introductory differentia geometry. Prerequisite: Math 140.

142 Theory of Differential Equations (3) Taam

Linear and some nonlinear differential equations. Topics include ex istence theorems, stability, control theory, limit cycles, and applica tions to physics and ecology. Prerequisite: Math 139 and 123 or 124 or permission of instructor. (Fall)

153 Introduction to Numerical Analysis I (3) Gupt

Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices Solution of nonlinear equations. Interpolation and approximate repre sentation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming. (Fall, even years)

154 Introduction to Numerical Analysis II (3) Gupt

(Formerly Difference Equations)

Numerical differentiation and integration. Solution of ordinary dif ferential equations. Introduction to optimization theory, gradient techniques. Least squares and applications, data fitting. Prerequisite Math 153 or permission of instructor. (Spring, odd years)

157 Introduction to Complex Variable Theory (3) Henney and Staff

Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

168 Seminar: Curriculum Studies (3) Bari and Staff

Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite Math 31 and permission of instructor.

181–82 Seminar: Applied Mathematics (3–3) Hayes, Glick

Prerequisite: Math 140, Stat 189-90, some knowledge of linear alge bra, senior status as major in Applied Mathematics. (Academic year)

191 Special Topics (arr.) Staff

Admission by permission of instructor. May be repeated for credit Offered upon demand.

195 Reading and Research (arr.) Staff

Under the personal direction of an instructor. Limited to mathe matics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit (Fall or spring)

Third Group

Courses marked with an asterisk (*) are offered every year.

ALGEBRA

*201–2 **Modern Algebra I and II** (3–3) Lee
Fundamental concepts of groups, rings, and fields. (Academic year)

203 **Modern Algebra III** (3) Lee
Galois theory and valuation theory. (Fall 1979 and alternate years)

204 **Representation Theory** (3) Lee
Representations of groups and algebras.

205 **Matrix Theory** (3) Katz
Topics chosen from the following: inequalities, non-negative matrices and their applications, infinite dimensional vector spaces, multilinear algebra, bilinear and quadratic forms.

206 **Topics in Algebra** (3) Staff

ANALYSIS AND APPLIED MATHEMATICS

*211 **Complex Analysis I** (3) Liverman
Topology of complex numbers; elementary functions; integrals; Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Fall)

212 **Complex Analysis II** (3) Henney and Staff
Harmonic functions, partial fractions. Mittag-Leffler theorem; entire functions, the Hadamard product theorem, the gamma function; Hurwitz's theorem, normal families of functions. The Riemann mapping theorem; analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent.

213 **Applications of Complex Analysis** (3) Liverman and Staff
Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions; steepest descent, stationary phase, and WKB methods, Fourier and Laplace transforms, Wiener-Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables. (Spring)

*214 **Measure and Integration Theory** (3) Junghenn and Staff
Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon-Nikodym theorem; measure on product spaces; Fubini theorem. L^p spaces. Prerequisite: advanced calculus. (Spring)

*215 **Introduction to Functional Analysis** (3) Taam
Topological and metric spaces; Tychonoff theorem; completion of a metric space; Normed and Banach spaces; linear functionals and operators; Hahn-Banach theorem; principle of uniform boundedness; the closed-graph theorem and interior mapping principle; Hilbert spaces;

eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: advanced calculus. (Fall)

216 **Banach Algebras and Spectral Theory of Operators (3)** Tasa
Gelfand theory of commutative Banach algebras; function algebras; Stone-Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introduction to functional analysis, and Tychonoff and Stone-Weierstrass theorem. (Spring)

217 **Introduction to Ordinary Differential Equations** (3) Glick and Staff
First course in ordinary differential equations; existence and uniqueness of solutions; continuity of solutions with respect to initial conditions; properties of linear systems. Prerequisite: advanced calculus. (Fall, even years)

218 **Topics in Ordinary Differential Equations** (3) Staff
Topics to be chosen from stability theory, non-linear oscillations, equations with delays.

219–20 **Techniques of Partial Differential Equations** (3–3) Liverman
Math 219: Linear first- and second-order equations. Applications to probability theory and mathematical physics. Prerequisite: knowledge of advanced calculus and rudiments of linear algebra and complex variables. Math 220: First-order equations and systems. Characteristics and bi-characteristics. Variational and transform methods. Integral equations and boundary-value problems. Prerequisite: Math 219, knowledge of undergraduate linear algebra and analytic function theory. Alternate academic years.

221 **Calculus of Variations** (3) Staff
Introduction to the calculus of variations via the notion of the Fréchet derivative, the Euler equations, the Hamilton-Jacobi equations; sufficient conditions for a solution to exist, applications to mechanics and physics, control theory.

222 **Introduction to Numerical Analysis** (3) Gupta
Computer arithmetic and round-off errors. Solution of linear systems and nonlinear equations. Interpolation and approximations. Numerical differentiation and integration. Eigenvalues and eigenvectors. Prerequisite: knowledge of advanced calculus and computer programming. (Fall, odd years)

223 **Numerical Solution of Ordinary and Partial Differential Equations** (3) Gupta
(Formerly Introduction to Numerical Analysis)
Initial and boundary value problems for ordinary differential equations. Error propagation, convergence and stability. Finite difference and finite element methods for partial differential equations. Prerequisite: knowledge of differential equations and computer programming. (Spring, even years)

224 **Generalized Functions and Operational Methods** (3) Liverman
Theory of Schwartz distributions. Operational calculus of generalized functions. Generalized function Fourier series, Fourier and Laplace transforms, applications to initial and boundary-value problems. Prerequisite: advanced calculus.

225 **Theory of Generalized Functions and Distributions** (3) Liverman

Fréchet and countable union spaces; structure, and properties of Schwartz distributions and Gelfand-Silov generalized functions; applications to explicit solutions and existence theory of ordinary and partial differential equations, nested Hilbert spaces; generalized Fourier transform. Prerequisite: Math 211 or permission of instructor.

226 **Control Theory** (3) Glick

Optimal control of linear systems, control of linear systems with convex cost functionals, the maximal principle and selected topics on control systems. (Spring)

227–28 **Introduction to System Theory** (3–3) Staff

Analysis of discrete and continuous systems of various types. States and system dynamics and problems of control, optimization and stability. Prerequisite: background in advanced calculus and linear algebra.

229 **Mathematical Programming** (3) Katz

Simplex methods, including discussion of degeneracy. Duality theory; applications to the transportation and assignment problems. Nonlinear programming, including dynamic and geometric programming.

230 **Topics in Analysis** (3) Junghenn

Invariant means on semi-groups. (Offered as the demand warrants)

231 **Topics in Applied Mathematics** (3) Liverman

Integral transforms. Fourier, Laplace, Mellin, and Hilbert transforms of functions and generalized functions. Applications to O.D.E., P.D.E., and integral equations of applied mathematics, physics, and engineering. (Offered as the demand warrants)

232 **Topics in Numerical Analysis** (3) Gupta

Finite element methods. (Offered as the demand warrants)

241–42 **Mathematical Foundations of Stochastic Processes** (3–3) Junghenn

Fundamentals and applications of stochastic processes, beginning with a rigorous development of the requisite measure theory, probability theory, and Fourier analysis on R^n, and culminating in an in-depth study of Martingales, Markov processes, Brownian motion, and Poisson processes. Applications will be made to the life sciences, physics, engineering, and gambling. Prerequisites: advanced calculus and linear algebra.

COMBINATORIAL MATHEMATICS

261 **Combinatorics** (3) Bari

Generating functions, recurrence relations, counting theorems. Selected topics. Applications to statistical mechanics, information theory, design of experiments, operations research, linear and dynamic programming, network theory. Prerequisite: undergraduate modern algebra and linear algebra. (Spring, odd years)

262 **Graph Theory** (3) Bari

Electrical and other networks, matroids, chemical isomers, crystal structure, linear programming, operations research, Markov chains,

Feynman diagrams, selected topics in graph theory from introductory topics to problems currently of research interest. (Spring, even years)

263 **Topics in Combinatorial Mathematics** (3) Staff

LOGIC

*271 **Introduction to Mathematical Logic** (3) Nelson
Propositional and predicate calculus (first order): syntax, formation rules, semantics, axioms, proof and deduction, object vs. metalanguage, deduction theorem, compactness theorem, Gödel-Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic: incompleteness and undecidability.

272 **Topics in Logic** (3) Nelson
Selected topics from recursive function theory, model theory, set theory, or proof theory.

TOPOLOGY

*281–82 **General Topology** (3–3) Kenyon and Staff
General topological spaces, separation axioms, compactness and connectedness. Metrization, uniform spaces, and complete spaces. (Academic year)

283–84 **Topological Groups** (3–3) Green
General theory of topological groups; uniform structures on groups, products and inverse limits. Locally compact groups, classical linear groups and Lie groups. Prerequisites: General topology including uniform spaces, linear algebra, and real and complex variables. Prerequisite: general topology including uniform spaces, linear algebra, and elementary group theory.

285 **Topological Vector Spaces** (3) Junghenn
Vector space topologies, linear manifolds, metrizability and complexification. Locally convex topological vector spaces, projective and inductive topologies, barrelled and bornological spaces. Prerequisite: general topology including uniform spaces, linear algebra, and real and real and complex variables.

287 **Differentiable Manifolds I** (3) Glick
Differentiable manifolds, tangent vectors, sub-manifolds, imbeddings and immersions, vector fields and differential equations on manifolds, tensors and differential forms, Lie derivatives, orientability. (Fall—offered as the demand warrants)

288 **Differentiable Manifolds II** (3) Glick
Manifolds with boundary, integration on manifolds, Stoke's theorem and the divergence theorem, the Brouwer fixed-point theorem, deRham groups, Riemannian manifolds, geodesics, curvature. (Spring—offered as the demand warrants)

289 **Topics in Topology** (3) Staff

RESEARCH

*295 **Reading and Research** (3) Staff
May be repeated once for credit. (Fall and spring)

Fourth Group

*398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

*399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MICROBIOLOGY—GRADUATE PROGRAMS

Professors R. Hugh, E.M. Lerner II *(Research)*, L.F. Affronti *(Chairman)*, K. Huang, M. Reich, P.D. Kind
Associate Professor Y. Chu *(Research)*
Associate Professorial Lecturer R.F. DeGiovanni-Donnelly
Assistant Professor G.V. Stokes

Master of Science in the field of microbiology—Prerequisite: a bachelor's degree with a major in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BiSc 11–12; Chem 11–12, 151–52, 153–54; Math 30, 31 (31 may be taken concurrently with the graduate program); Phys 1, 2.

Required: the general requirements, pages 91–99. A total of 30 semester hours is required, 24 hours of course work and six hours of thesis (Micr 299–300). The course work must include Micr 211 (if not taken prior to admission), plus Bioc 221–22; Micr 277–78; and completion of the biostatistics tool requirement. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

Doctor of Philosophy in the field of microbiology—Required: the general requirements, pages 91–93, 99–101. Candidates must fulfill the tool requirement by completing biostatistics and by either passing a reading knowledge examination in French or German, or completing satisfactorily six semester hours in an approved tool option such as electron microscopy. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: clinical microbiology, determinative bacteriology, immunochemistry, immunology, microbial genetics, microbial pharmacology, microbial physiology, and virology.

211 **Microbiology** (4) Staff
Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 **Pathogenic Bacteriology** (3) Hugh
Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial

diseases of man. Prerequisites: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 Tissue Cell Culture and Somatic Variation (3) Piper

Fundamental aspects of the culture of animal, plant, and insect cells. Specialized techniques and applications of tissue culture procedures. Prerequisite: Micr 211 or equivalent. (Spring)

215 Medical Parasitiology (2) Baranski

Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 Scientific Writing (1) Wagner

A basis for preparing theses, dissertations, and publications. (Fall)

225 Microbial Physiology I (3) Reich

Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 221–22, Micr 211, or equivalent. (Fall)

226 Microbial Physiology II (3) Reich, DeGiovanni-Donnelly

Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 Immunology (3) Kind, Affronti

Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor. (Fall)

230 Immunology Laboratory (2) Kind, Affronti

Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Laboratory fee, $20. (Fall, odd years)

231 Immunobiology (1) Affronti, Kind

Study of immunological functions of reticulo-endothelial tissues, theories of auto-immunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. Prerequisite: Micr 201* or 229, and permission of instructor. (Fall)

233 Virology (3) Stokes

Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 Virology—Laboratory (2) Stokes

Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 Systematic Bacteriology (2) Hugh

History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall, odd years)

* For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*.

251 Clinical Laboratory Bacteriology (3) — Hugh

For graduate students; open to medical students. Detection and identification of bacterial agents which cause diseases in humans. Comparative isolation and identification methods; emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 212 or equivalent. (Fall, even years)

255 Clinical Virology (1) — Huang

General principles of virology; emphasis on clinical situations. Prerequisite: Micr 212 or equivalent. (Fall)

257 Experimental Immunochemistry (3) — Affronti

Biochemical and physiochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee, $20. Limited enrollment. (Spring, even years)

258 Microbial Genetics (2) — De Giovanni-Donnelly

Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

260 Cellular Immunology (1) — Kind

Advanced seminars in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 229. (Spring)

277–78 Seminar: Microbiology (1–1) — Staff

Required of graduate students. (Academic year)

293 Special Topics in Microbiology (arr.) — Staff

Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 Research in Microbiology (arr.) — Staff

Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3) — Staff

(Fall and spring)

398 Advanced Reading and Research (arr.) — Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.) — Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MUSEUM STUDIES—GRADUATE PROGRAM

Committee on Museum Studies

J.C. Anderson, A.D. Andrews, R.K. Evans *(Chairman and Acting Director of Program)*, V.K. Golla, R.L. Humphrey, M.P. Lader, B. Mergen, R.K. Packer, C.R. Rose

The Committee serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

The Graduate School of Arts and Sciences offers an interdepartmental pr gram leading to the degree of Master of Arts in the field of museum studie This program provides students with a broad background in museum studie including a variety of specialized approaches to museum work, with conce trations in conservation, museum administration and collections managemen and exhibiting.

The Program is designed primarily to prepare students to work with hi torical and scientific collections. Students whose principal career interests ar in art collections and galleries should apply for candidacy in the program fo the Master of Arts in the field of art history with a concentration in museu training, offered by the Art Department. Students whose career interests ar primarily in curatorial positions with ethnographic and archeological materia should apply for candidacy for the Master of Arts in the field of anthropolog with a concentration in museum training. Students whose career interests ar primarily in curatorial positions with historical materials should apply fo candidacy for the Master of Arts in the field of American studies, with a con centration in museum training. Students whose career interests are in museu education should apply for candidacy in the program for the Master of Arts i Teaching—Museum Education, offered by the School of Education and Huma Development.

Students applying for candidacy in the Museum Studies Program must mee all general requirements for admission to the Graduate School of Arts and Sciences, including a baccalaureate degree with a major, or its equivalent, i anthropology, art history, American studies, or natural science. In addition, th student should have taken at least six credit hours in each of these fields an at least nine credit hours in one of them, other than the student's undergraduat major, or must show equivalent preparation. There are additional prerequisite for specialization in ethnographic or archeological conservation.

Master of Arts in the field of museum studies—Required: the general re quirements, pages 91–99. The degree requires a minimum of 42 hours of cours work. At least 15 hours of course work must be in an academic core discipline, for example, American studies, anthropology, biological sciences, geology an paleobiology, public administration, or an appropriate interdisciplinary com bination. At least 15 hours of course work must be in museum studies courses in conservation, museum administration, and exhibiting. Six to 12 hours mus be in a museum internship in the Washington area or elsewhere. The studen must pass a comprehensive examination based on course work and submit a research paper of publishable quality. In addition, the student must fulfill th tool requirement by passing a reading examination in an approved foreign language, an approved course in statistics or computer programming, an ap proved course in organic chemistry for those specializing in conservation, or other approved courses.

MUSEUM STUDIES

Third Group

201 **Introduction to Museum Studies** (3) Evans

An introduction to the field of museum work—the history and pur poses of museums; the types and variety of museums; natural sci ence, social science, and history museums; the organization and functioning of museums; the role of museums in the community, the nation, and the world; collections, curation, research, conservation, exhibition, and education. (Fall)

216 **Collections Management in the Natural History Museum** (3) — Collier, Wilcox

General principles of collections management—preservation, storage, maintenance, and documentation of natural science and anthropological specimens. Topics include storage hardware systems, environmental effects on collections, inventory control, registration systems, and data storage and retrieval. (Spring))

233 **Materials and Techniques of Art and Archeological Artifacts: Inorganic Materials** (3) — Zycherman

A non-technical course for archeologists, anthropologists, and art historians. Nature of the materials of objects of art and archeology. Physical properties of the raw materials, techniques used to shape them into objects, and the final structure of the objects. (Fall)

234 **Materials and Techniques of Art and Archeological Artifacts: Organic Materials** (3) — Zycherman

A non-technical course for archeologists, anthropologists, and art historians. Nature of the materials of objects of art and archeology. Physical properties of the raw organic materials, techniques used to shape them into objects, and the final structure of the objects. (Spring)

255 **Problems of Small Museums** (3)

A detailed survey of the problems involved in planning, developing, funding, and operating small museums. Topics include: goals and objectives, record keeping, budgeting, exhibit design, exhibit production, conservation of specimens, security, training guides, and evaluation. (Fall)

291 **Museum Internship** (3) — Staff

Individual work experience and/or research experience in museums of the Washington area and possibly elsewhere. Each student should make arrangements with the Coordinator of Internships and/or the Acting Director. Museum internships are supervised by one (or more) member(s) of the cooperating museum staff in the area of museum management, conservation, exhibiting, etc. May be repeated for credit. (Fall, spring, summer)

295 **Directed Research** (3) — Staff

Individual research on special topics of the museum field. Topics must be approved by the Acting Director of Museum Studies. May be repeated for credit. (Fall, spring, summer)

297 **Special Topics in the Museum Field** (3) — Staff

Special topics may be organized by the Museum Studies staff or by request of six or more students.

MUSEUM STUDIES COURSES OFFERED BY OTHER DEPARTMENTS

Conservation:

Art/Anth 292: *Introduction to Conservation*
Art/Anth 293: *Conservation Laboratory Techniques*
Art/Anth 211: *Seminar: Problems in Conservation*
Art/Anth 212: *Advanced Conservation Techniques*
Anth 295: *Research*

Administration:

Art 129–30: *Principles of Museum Work*
Art 213: *Museum Administration and Governance*
Art 214: *Museum Administration and Trusteeship*
Art 217–18: *Problems in Museum Work*
Educ 310: *Museum Studies*
Educ 311: *Museum Audiences*

Exhibiting:

Art 209–10: *Exhibition and Display Design*
Anth 264: *Seminar: Museum Techniques*
AmCv/Anth 270: *Seminar: Museum Exhibiting*
Anth 291: *Anthropology in the Museum*
Educ 311: *Museum Audiences*

Internships:

Art 201–2: *Museum Projects*
Art 271–72: *Museum Techniques*
Anth 290: *Advanced Museum Research*
AmCv 251: *Museum Research and Education*
Educ 312: *Internship in Museum Education*

MUSIC

Professors G. Steiner *(Chairman)*, R. Parris
Professorial Lecturer E. Meyers
Associate Professor N.A. Tilkens
Assistant Professor R.J. Guenther
Adjunct Assistant Professor M.C. Tolson *(Piano)*
Assistant Professorial Lecturer B. Feinstein
Studio Lecturers in Applied Music S.K. Kim *(Piano)*, M. McNabb *(Piano and Organ)*, M. Peris *(Piano)*, C.A. Rachlin *(Piano)*, C.O. Dash *(Voice)*, S.H. Prussing *(Voice, Director of Choral Activities)*, J.E. White *(Voice)*, R. Parnas *(Violin and Viola)*, R.A. Norris *(Guitar)*, N.M. Irvine *(Bass)*, W.H. Mann *(Flute)*, T.P. Perazzoli *(Flute)*, R.O. White *(Oboe)*, W.R. Wright *(Clarinet and Saxophone)*, L. Lipnick *(Bassoon)*, R. Odmark *(French Horn)*, D. Rorick *(Trumpet)*, T.H. Wardlow *(Percussion Instruments)*, B.R. Seidman *(Harp)*, M.C. Sislen *(Guitar)*, A. Lee *(Voice)*, P. Gieseler *(Voice)*, E.M. Guenther *(Organ and Piano)*, G. Kreplin *(Guitar)*, R.T. Daniels *(Recorder)*, P.P. Fischer *(Flute)*, R.J. Blatt *(Cello)*

***Bachelor of Arts with a major in music (departmental)*—The following requirements must be fulfilled:**

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses—Mus 2, 5–6, six hours of applied music lessons, a minimum of four semesters in music ensemble groups.

3. Required courses in related areas—12 hours of one foreign language (French, German, or Italian recommended).

4. Required courses in the major—Mus 101, 102, 103, 104, 131–32, 138, 151; six additional hours of applied music courses. Students preparing for graduate study or professional concentration in music may elect a further program of

specialization in music literature, theory, or applied music. (Music theory majors must meet departmental requirements for proficiency in piano; applied music majors must perform a complete public recital or the equivalent in major solo performances.)

Master of Arts in the field of musicology—Prerequisite: a bachelor's degree with a major in music, or an equivalent degree.

Required: the general requirements, pages 91–99. The program of study consists of 30 semester hours of course work including a thesis (six semester hours).

Master of Music in the field of music theory, music composition, conducting, or applied music—Prerequisite: a bachelor's degree with a major in music or an equivalent degree.

Required: the general requirements, pages 91–99. The required second- and third-group course work is as follows:

1. *In the field of music theory*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques.

2. *In the field of music composition*—Thirty semester hours of course work including a creative thesis of one composition in large form properly prepared for performance (chamber music, a symphonic form, or a choral work with orchestral accompaniment) including a written theoretical, formal, and harmonic analysis of the work.

3. *In the field of conducting*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques. The requirements also include acceptable public conducting performances.

4. *In the field of applied music*—Thirty semester hours distributed as follows: (a) 12 semester hours of applied music in the area of concentration; (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (six semester hours). The thesis consists of a public recital and performance before a designated committee (such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level), and delivery of an historical and analytical lecture on the musical content of the program; demonstrated leadership in an ensemble performance (opera or oratorio for voice); and a written report on some approved theoretical area related to the student's concentration.

Bachelor of Arts in Education and Human Development with a teaching field in music—Prerequisite: the education curriculum, page 114.

Required: the music option and professional courses listed on page 118.

MUSIC THEORY, HISTORY, AND LITERATURE

First Group

1 Elements of Music Theory (3) **Staff**

Notation, scales, keys, intervals, terms, rhythms, and chord structure. (Fall and spring)

2 Ear-training (3) **Staff**

Melodic and harmonic dictation, ear-training, sight-singing, elementary keyboard harmony. (Spring)

3 Introduction to Musical Understanding (3) Steiner, Guenther

Introductory history of musical styles, related to listening; study of music materials and media. (Fall and spring)

4 Survey of Music Literature (3) — Steiner
Introductory study of musical forms, structures, and textures; aural analysis of selected literature. (Spring)

5–6 Harmony (3–3) — Parris, Guenther
Triads, inversions; chord analysis, construction, and progression; part-writing, modulations, altered chords. Prerequisite: Mus 1 or satisfactory passing of placement examination. (Fall and spring)

7 Music of Nonwestern Cultures (3) — Tilkens
Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa. (Fall)

8 History of Jazz (3) — Staff
Introduction to the styles, composers, and performers of jazz music from its origins to the present. (Summer)

Second Group

101–2 History of Music I (3–3) — Tilkens
Development of music in the Western world from the early Christian era through the Baroque. (Academic year)

103–4 History of Music II (3–3) — Tilkens
Development of Western music from the Classic period to the present. (Academic year)

109 Orchestra Literature (3) — Steiner
Survey of the history and styles of orchestra literature, analysis of representative works. (Spring)

110 Chamber Music Literature (3) — Steiner
Survey of the history and styles of chamber music literature, analysis of representative works.

121 The Opera (3) — Feinstein
Survey of the history and styles of opera, analysis of representative works.

125 Keyboard Music Literature (3) — Tilkens
Survey of the history, style, and major content of the keyboard literature from the 16th century to the present.

131–32 Advanced Theory (3–3) — Parris
Practice in 18th-century contrapuntal writing and analysis, chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent (Academic year)

133–34 Composition (3–3) — Parris
(Academic year)

135 Counterpoint (3) — Parris
Study and practice of 16th-century contrapuntal techniques. (Fall)

137 Orchestration (3) — Parris
Instrumental scoring. (Spring)

138 **Form and Analysis** (3) — Parris
Analysis of musical forms in representative musical literature. (Spring)

151 **Conducting** (3) — Steiner
Technique of conducting, score reading, rehearsal procedures, analysis, and interpretation of selected musical literature; practice in conducting. (Fall)

160–61 **Electronic Music** (3–3) — Meyers
Tape and electronic techniques, synthesizer use, and acoustical principles.

173 **Pedagogy** (3) — Steiner
Principles, materials, and methods of teaching in a selected area. See *Schedule of Classes* for specific area.

199 **Independent Research** (3) — Staff
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

Third Group

203 **Bibliography and Research Methodology** (3) — Guenther
(Fall)

205 **Music of the Baroque Period** (3) — Tilkens
Study of the musical styles, techniques, and literature from 1600 to 1750. (Fall)

206 **Music of the Classic Period** (3) — Guenther
Study of styles, techniques, and literature from the 18th-century schools through Haydn, Mozart, and Beethoven.

207 **Music of the Romantic Period** (3) — Guenther
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century. (Fall)

208 **Music of the 20th Century** (3) — Guenther
The principal schools, techniques, developments, and trends of the 20th century. (Spring)

231–32 **Composition** (3–3) — Parris
May be repeated for credit. (Academic year)

234 **Seminar: Performance Practices in Selected Areas** (3) — Staff

237 **Seminar: Analytical Studies in Music Theory** (3) — Guenther
(Fall)

238 **Seminar: Analytical Studies in Music History** (3) — Parris, Tilkens
Fall: Mozart; spring: Brahms.

239 **Independent Research** (3) — Staff

251–52 **Advanced Conducting** (3–3) — Steiner
(Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

APPLIED MUSIC

All applied music courses are offered both fall and spring, and may be repeated for credit.

Mus 51, 52, 53, 54 and 55 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.
2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, $100.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Supplementary fees are different for courses offered during the summer sessions. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors.

First Group

Required practice: three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

11 **Piano** (1)	Staff
12 **Piano** (2)	
13 **Voice** (1)	Staff
14 **Voice** (2)	
15 **Organ** (1)	McNabb, E. Guenther
16 **Organ** (2)	
17 **Violin** (1)	Steiner, Parnas
18 **Violin** (2)	
19 **Classical Guitar** (1)	Staff
20 **Classical Guitar** (2)	
21 **Viola** (1)	Parnas
22 **Viola** (2)	
23 **Cello** (1)	Blatt
24 **Cello** (2)	
25 **Bass** (1)	Irvine
26 **Bass** (2)	
27 **Flute** (1)	Staff
28 **Flute** (2)	
29 **Recorder** (1)	Daniels
30 **Recorder** (2)	
31 **Oboe** (1)	R. White
32 **Oboe** (2)	
33 **Clarinet** (1)	Wright
34 **Clarinet** (2)	
35 **Saxophone** (1)	Wright
36 **Saxophone** (2)	

37 **Bassoon** (1)
38 **Bassoon** (2) — Lipnick

39 **French Horn** (1)
40 **French Horn** (2) — Odmark

41 **Trumpet** (1)
42 **Trumpet** (2) — Rorick

43 **Trombone** (1)
44 **Trombone** (2) — Guenther

45 **Percussion** (1)
46 **Percussion** (2) — Wardlow

47 **Harp** (1)
48 **Harp** (2) — Seidman

49 **Tuba** (1)
50 **Tuba** (2) — Staff

51 **Orchestra** (1) — Steiner
Preparation and performance of orchestral literature. Prerequisite: audition before director. (Fall and spring)

52 **Instrumental Ensemble** (1) — Steiner
Chamber ensemble groups approved by audition. (Fall and spring)

53 **Chorus** (1) — Staff
Preparation and performance of choral literature. Prerequisite: audition before director. (Fall and spring)

54 **Chamber Choir** (1) — Staff
Small vocal groups and chorus participation. Prerequisite: audition before director. (Fall and spring)

55 **Band** (1) — Wright
Concert band, stage band and brass ensemble. (Fall and spring)

Second Group

Departmental prerequisite: audition to meet departmental requirements.
Required practice: six hours a week for one-semester-hour courses and 12 hours a week for three-semester-hour courses. In addition, three-semester-hour courses include master performance classes and recital preparation.

111 **Piano** (1)
112 **Piano** (3) — Staff

113 **Voice** (1)
114 **Voice** (3) — Staff

115 **Organ** (1)
116 **Organ** (3) — Staff

117 **Orchestral Instrument** (1)
118 **Orchestral Instrument** (3) — Staff

119 **Classical Guitar** (1)
120 **Classical Guitar** (3) — Staff

Third Group

All courses include supervised ensemble preparation and required concert solo performances.

211 **Piano** (3)
213 **Voice** (3)
215 **Organ** (3)
217 **Orchestral Instrument** (3)

NEW COURSES IN GENERAL AND INTERDISCIPLINARY STUDIES—700 SERIES

Two sets of course numbers have been designated to identify new courses sponsored by this program in Columbian College, the School of Education and Human Development, the School of Government and Business Administration, and the National Law Center:

701 (General Studies)
721 (Interdisciplinary Studies)

In each case, the course title will be completed by a brief description of the topic of the individual course. Because the courses will be changing constantly, interested students should consult the *Schedule of Classes* for the current semester. The courses will be listed with the other offerings of participating departments.

The 701 number will be used to designate courses taught by individual faculty members. They will explore topics not normally included in departmental offerings, and will utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 721 number will designate upper-level courses in which faculty from two or more departments investigate a topic of mutual academic interest.

PATHOLOGY—GRADUATE PROGRAM

Professors H. Sidransky *(Chairman)*, F.N. Miller, S. Bloom
Associate Professors S.G. Kent, B.C. Zook *(Comparative)*, Y. Al-Doory, C.T. Garrett
Assistant Professor J.M. Orenstein

Programs of study leading to the degree of *Associate in Science (Medical Laboratory Technique)* are described in the *School of Medicine and Health Sciences Bulletin.*

Doctor of Philosophy in the field of pathology—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.D.S.). In exceptional cases, applicants with other backgrounds in the life sciences may be accepted.

Required: the general requirements, pages 91–93, 99–101, including 48 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 283, may be counted for a maximum of 24 semester hours of graduate course work. Other experience must satisfy the eligibility requirements of the appropriate national certifying body, i.e., the American Board of Pathology in the case of the M.D., the American College of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

Research fields: comparative pathology, human pathology, ophthalmic pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

Third Group

203–4 Pathology (4–4) — Staff

General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205; or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

205 Comparative Pathology I (3) — Zook

Joint offering of the Departments of Pathology and Biological Sciences. An introduction to the study of disease in vertebrates, comparison with disease in man. Mechanisms by which various agents provoke illness; body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended: courses in anatomy, histology, and physiology.

210 Comparative Pathology Laboratory (2) — Zook, Montali*

Participation in an autopsy service involving captive wild animals and comparison of diseases in various animal species with those in man. Open to limited number of graduate students, with permission. (Fall)

215 Perinatal Pathology Laboratory (2) — Kent

Special assignments for dissection and study. Open to limited number of graduate students, with permission. (Fall)

220 Medical Mycology (2 or 4) — Al-Doory

Study of pathogenic fungi, mycotic diseases and their clinical aspects. (Fall)

221 Medical Mycology Laboratory (1) — Al-Doory

Laboratory complement to Path 220. Prerequisite or concurrent registration: Path 220. Laboratory fee, $20. (Fall)

222 Opportunistic Mycoses (2) — Al-Doory

Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

272–73 Seminars in Mycology (1–1) — Al-Doory

Conferences and discussions on current topics and latest developments in medical mycology. May be repeated for credit. (Academic year)

275 Research in Mycology (2 to 4) — Al-Doory

Participation in experimental studies in mycotic diseases. Research in laboratory medicine on topics related to medical mycology. May be repeated for credit. (Fall and spring)

276 Seminar in Experimental Pathology (1) — Staff

Presentations on current topics in experimental pathology. (Fall and spring)

* Richard Montali is Assistant Clinical Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

281 **Anatomic Pathology Clerkship I** (arr.) Staff

A practical course in gross and microscopic human pathology. Prerequisite: Path 203–4 or equivalent. Students spend up to 24 weeks full-time, or the equivalent part-time, on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week full-time period. Open to limited number of graduate students, with permission. (Spring)

283 **Anatomic Pathology Clerkship II** (arr.) Staff

Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

295 **Comparative Pathology II** (arr.) Zook, Casey,* Montali

Participation in veterinary pathology service, including wild and domestic animals. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time. Open to limited number of graduate students, with permission.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHARMACOLOGY

Professors H.G. Mandel *(Chairman)*, V.H. Cohn, P. Mazel, S.E. Fabro *(Research)*, J.A. Straw, P. Klubes
Professorial Lecturers J. Axelrod, E. Costa
Associate Professors F.P. Abramson, A.M. Suria
Assistant Professors R.J. Anderson, B.L. Slack-Bean, N.A. Brown

Master of Science in the field of pharmacology—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: BiSc 11–12; Phys 1, 2; Chem 11–12, 22, 151–52, 153–54. One year of calculus and a course in physical chemistry are also recommended.

Required: the general requirements, pages 91–99, including Bioc 221–22; Phyl 201, 212; Phar 203, 205, 299–300.

Doctor of Philosophy in the field of pharmacology—Required: the general requirements, pages 91–93, 99–101.

* Harold Wilton Casey is Clinical Professor of Pathology at the G.W.U. School of Medicine and Health Sciences.

Research fields: biochemical pharmacology, cancer chemotherapy, developmental pharmacology and toxicology, endocrine pharmacology, molecular pharmacology, neuropharmacology, neurotoxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and physiological disposition of drugs.

Second Group

114 Drugs and the Consumer (3) — Cohn and Staff

General concepts of drug action in the body. Action mechanism of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache, and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus tradename drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall)

115 Nonmedical Use of Licit and Illicit Drugs (3) — Klubes and Staff

Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring)

Third Group

203 Fundamental Principles of Pharmacology and Toxicology (3) — Cohn and Staff

Basic principles of pharmacology, including drug receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of the instructor. (Fall)

205 Pharmacology (8) — Cohn and Staff

Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

215 Adolescent Drug Abuse (3) — Cohn and Staff

Offered off campus through the College of General Studies. Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

220 Molecular Events in Toxic Actions (2) — Brown and Staff

Metabolism of xenobiotics to cytotoxic products. Environmental and genetic factors influencing toxic actions. Molecular mechanisms of toxicity. Prerequisite: Phar 203. (Spring)

222 **Genetic Toxicology** (2) Williams and Staff

The action of chemicals and radiation in the induction of DNA damage and repair *in vitro* and *in vivo*, and the sequelae of these processes in cells and mammals. DNA repair mechanisms, mammalian cell toxicity, mutagenesis, and carcinogenesis. Prerequisite: Bioc 221–22. (Fall)

224 **Developmental Toxicology** (2) Brown

The effects of exogenous agents on the processes of reproduction and development and their mechanisms of action. Toxic effects on the gametes, embryo, fetus, and neonate. Prerequisite or concurrent registration: Phar 203, 205. (Fall)

226 **Neurotoxicology** (2) Anderson

Mechanisms by which chemicals produce toxic effects on nervous tissue at the subcellular, systemic, and behavioral levels. Effects of chronic and acute exposure. Prerequisite or concurrent registration: Phar 203, 205. (Spring)

230 **Special Topics in Toxicology** (arr.) Staff

Selected aspects of toxicology. Content differs each time the course is offered. May be repeated for credit. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Suria and Staff

Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2 or 3) Mandel and Staff

Current theory on drug actions, especially chemotherapeutic agents, at molecular level. Effect of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and intermediary metabolites. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff

Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

259 **Cancer Chemotherapy** (2) Klubes and Staff

Selected readings and discussion of recent advances in cancer chemotherapy research. Prerequisite: Phar 201–2 or 205. (Spring, odd years)

260 **Endocrine Pharmacology** (1) Hertz and Staff

Lectures and seminars on recent advances in the pharmacology and mechanisms of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (arr.) Staff

Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff

Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn

Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological fac-

tors affecting these processes. Prerequisite: Phar 205 or permission of the instructor. (Spring, even years)

273 **Pharmacokinetics: Principles and Applications** (2) — Abramson and Staff

A description of compartmental and physiological models of drug disposition. Problem-solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology and Toxicology I-II** (1–1) — Anderson and Staff

Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology and Toxicology III-IV** (1–1) — Anderson and Staff

Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) — **Staff**

Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) — **Suria and Staff**

Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205 or equivalent. (Spring, odd years)

295 **Reading and Research** (arr.) — **Staff**

Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) — **Staff**

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) — **Staff**

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — **Staff**

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHILOSOPHY

Professors T.Z. Lavine, R.H. Schlagel *(Chairman)*
Associate Professors W.B. Griffith, R.S. French
Assistant Professors R.P. Churchill, J.D. Moreno

Bachelor of Arts with a major in philosophy (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying

the requirements for meaningful initiation into the social sciences and th natural and mathematical sciences.)

2. Required courses in related areas—six semester hours of literature course selected from Chinese, Classics, English, French, German, Italian, Slavic, o Spanish (Clas 71, 72, or Engl 191–92 recommended); six hours selected fro art history, music history, or religion; six hours in history (Hist 39–40 recom mended).

3. Required courses in the major—Phil 111, 112, 113; nine semester hour selected from Phil 121, 131, 132, 151, 152; six semester hours selected fro Phil 172, 192, 193; plus six additional semester hours of second-group philoso phy courses.

For students expecting to continue in graduate school, it is recommende that they include in their program of study 12 semester hours of introductor French, German, or Greek language courses.

Minor in philosophy—Required: 18 semester hours consisting of either Phi 50 and 3 hours chosen from Phil 111, 112, 113; or 6 hours chosen from Phil 11 112, 113; plus 12 hours of elective philosophy courses.

Master of Arts in the field of philosophy—Prerequisite: a bachelor's degre with an undergraduate major in philosophy at this University, or an equivalen degree. The undergraduate program should have included the following course or their equivalent: Phil 111, 112, 113, 121, 131, and 152.

Required: the general requirements, pages 91–99. The program of stud consists of a minimum of 30 semester hours of second- and third-group course with or without a thesis. A Master's Comprehensive Examination is required in two areas of philosophy: the history of philosophy; problems of philosophy and contemporary philosophy. Candidates must pass a reading knowledge ex amination in French, German or Greek.

Master of Arts in Special Studies with an area of concentration in philosophy and social policy—An interdisciplinary program which brings the normative historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements, pages 91–99. Two options are available at the discretion of the faculty: (1) a minimum of 24 semester hours of approved graduate course work plus the successful completion of a thesis, or (2) a minimum of 36 semester hours of graduate course work which does not include a thesis. All students are required to take four courses selected from the following: Phil 197, 231, 242, 271, 272. Phil 205 is open to all students; it is required of those with insufficient background in philosophy, as determined by the department. Phil 299–300 is required for students electing to write a thesis. The remainder of the course work in both options must include a majority of approved courses in the arts and sciences. Other courses may be selected from the School of Education and Human Development, School of Government and Business Administration, and School of Public and International Affairs. Each candidate must pass a Master's Comprehensive Examination based on the particular interdisciplinary composition of the student's program of study. Prospective candidates should consult Professor Roderick French, director of the program.

First Group

45 Introduction to Logic (3) Churchill

Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Spring)

50 **Introduction to Philosophy** (3) Staff
Readings from major philosophers and study of philosophic positions from Plato to Sartre. (Fall and spring)

71 **Philosophy and Literature** (3) Lavine
Philosophical foundations of psychoanalytical psychiatry, existentialism, and Marxism and their expression in literature, e.g., in the works of Mann, Kafka, Camus, Sartre, Hesse, Gide, and Koestler. (Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

111 **History of Ancient Philosophy** (3) Moreno
History of Western philosophy from early Greece to the early Middle ages. (Fall)

112 **History of Modern Philosophy** (3) Churchill
History of Western philosophy of the 17th and 18th centuries (Descartes to Kant). (Spring)

113 **19th-Century Philosophy** (3) Lavine
European philosophy from the Enlightenment and Kant to German Romanticism, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche. (Fall)

121 **Symbolic Logic** (3) Griffith
Systematic study of the principles of valid inference with attention to the development of skill in logical analysis and evaluation of arguments, and to the elementary theory of formal systems. (Fall)

127 **Theories of History** (3) Lavine
Joint offering of the Philosophy and History Departments. Major philosophies of history: Judeo-Christian, linear progressive, historicist, Hegelian-Marxian dialectical, cyclical (Vico, Spengler, Toynbee), and social-scientific (Comte, Weber). Contemporary problems of historical knowledge. (Fall)

131 **Ethics** (3) Griffith
Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Spring)

132 **Social Philosophy** (3) Lavine
Social philosophies from Locke to contemporary theorists. (Spring)

133 **Philosophy, Nonviolence, and the Problem of War** (3) Churchill
Problems of war in relation to morality; theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war. (Summer)

* An interdepartmental course offered by the Philosophy, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion Departments.

142 **Philosophy of Law** (3) Churchil
Systematic examination of fundamental concepts of law and juris prudence; special emphasis on the relationship between law an morality. (Fall)

151 **Myth, Science, and the Modern Mind** (3) Schlage
Comparison of the mythical and scientific outlook; emphasis on th development and nature of scientific concepts, methodology, and ex planation from Aristotle to Einstein. (Fall)

152 **Knowledge, Truth, and Reality** (3) Schlage
Inquiry into the basis and structure of knowledge, the problem o perception and independent reality, and the meaning and criteri of truth. (Spring)

162 **Aesthetics** (3) Moreno
Nature of aesthetic experience as related to artistic appreciation criticism, and creation; artistic representation as a kind of systematic symbolization. (Spring)

172 **American Philosophy** (3) Moreno
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Fall)

192 **Contemporary Philosophy: Analytical** (3) Churchill
The two dominant movements of recent Anglo-American philosophy, logical positivism and British ordinary language philosophy, as represented by Russell, G. E. Moore, Wittgenstein, Ryle, Ayer, etc. (Fall)

193 **Contemporary Philosophy: Phenomenological** (3) Griffith
Turn-of-the-century intellectual crisis and Husserl's phenomenological movement; the phenomenological existentialism of Heidegger and Sartre; existential Marxism in Sartre and Merleau-Ponty; Hermeneutics of Ricoeur and Gadamer. (Spring)

197 **Contemporary Ideologies and Utopias** (3) Lavine
A philosophic analysis of recent ideologies and utopias in Europe, the United States, and Asia: the sociological, psychological, political, and intellectual origins of ideologies; their theoretical structure and their practical functions; the relation of ideologies to social change; the significance of the diffusion of ideologies to other cultures; ideologies and the problem of value-relativity. (Fall)

198 **Philosophy of the Social Sciences** (3) Lavine
Philosophic issues relating to theory, methodology, and application of the social sciences. Analysis of one major contemporary social scientific project. (Spring)

199 **Readings and Research** (3) Staff
(Fall and spring)

Third Group

201–2 **Readings and Research** (3–3) Staff
Advanced readings and reports. Investigation of special problems. (Academic year)

205 **Selected Schools and Problems** (3) Staff

An advanced review of the rise of modern empiricism, idealism, and pragmatism, with particular attention to controversies regarding problems of method, epistemology, and social and political theory. Recommended for graduate students who have majored in fields other than philosophy. (Fall)

216 **Seminar: Kant** (3) Schlagel

Critique of Pure Reason.

221 **Seminar: Logic of Social Choice** (3) Griffith

Formal analysis of contrasting arguments justifying social choices: the appeal to welfare optimization, or to fairness of the social decision procedure. Special focus on Arrow's Impossibility Theorem. (Spring)

231 **Ethics and Economic Policy: Justice and Equality** (3) Griffith

Economic policy viewed from the perspectives of ethical and economic theories with special focus upon the issue of income distribution in the United States. (Fall)

242 **Philosophy, Law, and Social Reform** (3) Churchill

A philosophical investigation of moral and legal rights in the American tradition, the importance of claims of right and entitlement in policy issues, and the ways legal institutions define specific rights by limiting or giving effect to our duties and liberties. (Spring)

251 **Seminar: Philosophy of Science** (3) Schlagel

Selected topics. (Fall)

252 **Seminar: Epistemology** (3) Schlagel

Critical examination of selected problems or theories of knowledge. (Spring)

271 **Mankind and Nature in Public Policy** (3) French

Relation of philosophical conceptions of man and nature to national policies of growth and development in selected periods of American history. (Fall)

272 **American Philosophy and Mental Health Policy** (3) Moreno

(Formerly Pragmatic Naturalism and American Social Policy)

Analysis and application of philosophical modalities to conceptual problems in mental health care as related to the construction of a social policy. (Spring)

299–300 **Thesis Research** (3–3) Staff

PHYSICAL SCIENCE

See **Chemistry.**

PHYSICS

Professors H.H. Hobbs, J. Eisenstein, O. Bergmann, A.J. Zuchelli, F. Prat *(Chairman)*
Associate Professors W.C. Parke, N.K. Khatcheressian, D.R. Lehman, M.P Taragin, E.P. Harper
Assistant Professor J.R. Peverley

Bachelor of Arts or Bachelor of Science with a major in physics (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—Phys 3, 14, 15, 16; Chem 11–12; Math 31, 32, 33.
3. Required course in related area—Stat 97 or EE 51.
4. Required courses in the major—Phys 151, 161, 162, 163, 164, 165–66, 167, 168.

Minor in physics—Required: Phys 3, 14, 15, 16; Phys 163 and 164 or approved substitutes from 100-level physics courses.

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

1. The Master's degree program *with* thesis—Required: the general requirements, pages 91–99, and 30 semester hours of course work in physics, including Phys 231, 232, 233-34, 235, 236, 299–300; plus one of the following: Phys 241, 243, 244, 245, or 251–52.

2. The Master's degree program *without* thesis—Required: the general requirements, pages 88-96, and 36 semester hours of course work in physics and mathematics including Phys 231, 232, 233–34, 235, 236; plus one of the following: Phys 241, 243, 244, 245, or 251–52.

A reading knowledge of a foreign language, or the successful completion of Stat 197, with a grade of *A* or *B* is a tool requirement.

Doctor of Philosophy in the field of physics—Required: the general requirements, pages 91–93, 99–101, and the successful completion of one of the two following tool requirement options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of Stat 197 with a grade of *A* or *B*.

Research fields: experimental solid state physics (electrical conductivity of solids, defects in crystals, magnetic properties of solids at low temperatures, magnetic resonance, Mossbauer effect, superconductivity), and theoretical physics (elementary particles, field theory, general relativity, magnetic and optical properties of solids, molecular structure, nuclear and photonuclear reactions).

Bachelor of Arts in Education and Human Development with a teaching field in physics—Prerequisite: the education curriculum, page 114.
Required: the physics option and the professional courses listed on page 116.

Departmental Prerequisite: Phys 3, 14, 15, 16; two semesters of calculus or equivalent; and consent of a departmental advisor are prerequisite to all second-group courses.

Undergraduate departmental advisors: W. Parke, D. Lehman, N. Khatcheressian, M. Taragin

Graduate departmental advisors: H. H. Hobbs, J. Eisenstein, O. Bergmann, A. J. Zuchelli, F. Prats

ASTRONOMY

First Group

9–10 Introduction to Astronomy (3–3) Hobbs

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $11 a semester. (Academic year)

11–12 Introduction to Astronomy (2–2) Hobbs

Same as Phys 9–10 without the laboratory. (Academic year)

21 Modern Cosmology (3) Staff

Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

PHYSICS

First Group

1 Foundations of Physics (4) Parke

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $18.

2 Introduction to Modern Physics (4) Zuchelli

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $18.

3 Foundations of Physics (3) Parke

Same as Phys 1 without laboratory. This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 1.

4 Introduction to Modern Physics (3) Zuchelli

Same as Phys 2 without laboratory. This course may not be taken by students who have completed, or are enrolled in or plan to enroll in Phys 2.

6 Energy and the Environment (3) Lehman

Consideration of energy resources and their utilizational impact on the environment from a physical viewpoint. Topics include: the demand for energy, the cost of energy, nuclear fission-radiation hazard to humans, pollution due to energy sources, transportation of energy and waste, and energy converters. Prerequisite: high school algebra.

14 Introductory Mechanics and Thermal Physics (3) Khatcheressian

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus.

Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18.

15 **Elements of Electricity and Magnetism** (3) Taragin
Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's Law, Gauss' Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18.

16 **Introduction to Modern Physics** (3) Lehman
Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Topics include wave-particle duality, the hydrogen atom, Pauli's exclusion principle, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15; Math 32. Laboratory fee, $18.

27–28 **Physics in Medicine** (3–3) Parke
Principles of physics applied to biological systems and to medical instrumentation, including ultrasonics, circulation dynamics, bioenergetics, optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 2 or equivalent.

Second Group

151 **Intermediate Laboratory** (3) Taragin
Independent advanced work to introduce students to research techniques and use of specialized instruments. Laboratory fee, $11. (Fall and spring)

161 **Mechanics I** (3) Prats
Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Euler's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's equations.

162 **Mechanics II** (3) Prats
Basic aspect of continua, including elasticity and fluid dynamics, strain tensor, stress tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 **Physical and Quantum Optics** (3) Eisenstein, Hobbs
Oscillations and waves, energy and momentum of the electromagnetic field, interference, diffraction, geometrical optics, optics of crystals and other media, dispersion.

164 **Thermodynamics** (3) Taragin
Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 **Electromagnetic Theory** (3–3) Lehman, Eisenstein
Development of Maxwell's field equations using vector and tensor

calculus, electrostatics, stationary and nonstationary phenomena, basic circuit theory, electronmagnetic waves and radiation.

167 **Principles of Quantum Physics** (3) Khatcheressian

Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization; careful consideration of the laboratory results to which the theory is a response.

168 **Applied Quantum Physics** (3) Parke, Zuchelli

Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.

170 **Elementary Solid State Physics** (3) Khatcheressian

Structure of solids, lattices and lattice defects, deformation, vibrational and electronic contribution to specific heats, binding energies, electronic states in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and normal mode expansions are developed as needed.

175 **Nuclear Physics** (3) Lehman, Prats

Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid-drop model, beta-decay, fission, and fusion. Prerequisite: Phys 167 or permission of instructor.

195 **Undergraduate Research** (3) Staff

Research on problems approved by the staff. Admission by permission of the staff member concerned. May be repeated once for credit.

Third Group

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics.

231 **Electromagnetic Theory: Macroscopic Effects** (3) Eisenstein

Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, induced polarizations, time-dependent fields, frame dependence of the fields, gauge transformations, radiation fields.

232 **Advanced Mechanics** (3) Zuchelli

Analytic methods of mechanics as a basis for modern theory: variational principles, Lagrange's equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

233–34 **Quantum Mechanics** (3–3) Prats

General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations and transformation theory. Schrödinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

235 **Special Relativity** (3) Bergmann
Application of relativistic concepts to the basic fields of physics: space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

236 **Electromagnetic Theory: Electrodynamics and Radiative Effects** (3) Bergmann, Eisenstein
Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where suitable. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

241 **Statistical Mechanics** (3) Lehman, Bergmann
Study of classical and quantum equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining principles of statistical mechanics. Among topics considered: distribution functions, H-theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

242 **Atomic and Molecular Structure** (3) Bergmann
Structure of atoms and molecules, energy levels, binding energy, optical activity. Hartree and Hartree-Fock equations, spin-effects, rotational and vibrational effects, para-magnetic resonance, chemical binding.

243 **Solid State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Taragin
Atomic structure of solids and analysis of the binding of crystals. Crystalline forms and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid State Physics: Electronic Processes in Metals** (3) Khatcheressian, Eisenstein
Phenomena in metals and semi-conductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

245 **Quantum Electrodynamics: Theory and Applications** (3) Zuchelli
A presentation of the lower order effects depending upon the quantal nature of the electromagnetic field: Hamiltonian formulation and field quantization, perturbation calculations, Compton effect, photoelectric effect, electron-electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

246 **Quantum Field Theory** (3) Bergmann
Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S-matrix, dispersion relations, and renormalization program.

247 **Nuclear Theory** (3) Prats, Lehman
Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics and weak interactions.

248 Elementary Particles (3) **Parke**
Experimental properties and present theoretical understanding of sub-nuclear particles; applied S-matrix formalism; symmetry principles; unified models, and theories of weak, electromagnetic, and strong interactions.

249 Statistical Processes (3) **Zuchelli**
Analysis of problems involved in understanding and predicting the approach to equilibrium of a complex system within the classical context, as exemplified by rare or dense gases, ionized gases, or plasmas. Specific topics include Liouville equation, ergodic theory, Boltzmann equation, Boltzmann-Vlasov equation, Chapman-Enskog theory, Bogoliubov time scales, Prigogine type formalism, convergence questions.

250 Selected Topics in Modern Physics (3) **Staff**
Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories; dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate advisor. (Fall and spring)

251–52 Laboratory (3–3) **Staff**
Individual work on special topics. Laboratory fee, $15 a semester. (Academic year)

254 General Theory of Relativity (3) **Bergmann**
Physical principles and mathematical methods underlying Einstein's field equation, geodesic equations of motion, checks of the theory, action principle, conservation laws, perturbation theory, gravitational radiation theory, relativistic cosmology. Offered on demand.

291 Seminar (1) **Staff**
Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)

299–300 Thesis Research (3–3) **Staff**
(Fall and spring)

Fourth Group

398 Advanced Reading and Research (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. (Fall and spring)

399 Dissertation Research (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHYSIOLOGY—GRADUATE PROGRAMS

Professors C.S. Tidball, R.A. Kenney *(Chairman)*, M.E. Tidball, M.M. Cassidy, M.J. Jackson
Associate Professors R.A. Lavine, D.W. Watkins
Assistant Professor J.K. Kelleher

Master of Science in the field of physiology—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BiSc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements, pages 91–99. In addition to the thesis, the 30 hours of required work should include Phyl 201, 221, 298, and at least three semester hours of research (Phyl 295).

Doctor of Philosophy in the field of physiology—Required: the general requirements, pages 91–93, 99–101. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a minor field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination should include Bioc 221–22 or Phyl 205; Phyl 201, 221, 298, 396, 397.

Research fields and areas of study: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

Second Group

191 **Selected Topics in Human Structure and Function** (3) Kenney

Structural and functional basis of physiology. Required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor. (Fall)

Third Group

201 **Physiology** (8) Staff

Lecture (6 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 201, 221–22 (Bioc 222 may be taken concurrently) or Phyl 205; or consent of chairman of department. Open to Consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) Jackson

Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)

212 **Neurobiology** (3) Staff

Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) Cassidy

Staff and student presentations from literature. Present work dis-

cussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion on principles of fluid and acid-base balance and the application of these principles to scientific situations. (Fall)

260 **Membrane Physiology** (2) Jackson

Weekly lectures or seminar. Systematic review of the factors which determine the movements of water and solutes across simple cellular membranes and complex epithelial barriers in animal tissues. Prerequisite: Phyl 205 or permission of instructor. (Fall)

261 **Gastrointestinal Physiology** (1 or 2) Jackson

Weekly seminar; role of basic sciences in gastroenterology; intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Joint offering of the Biochemistry and Physiology Departments. Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: an introductory course in biochemistry and physiology, or permission of the department.

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball

Lecture one hour a week, practical experience at student's convenience. Orientation to processing analog and digital signals on mini-computers. Programming in assembly language as well as a high-level language of the student's choice. No previous computer experience necessary. (Fall)

271 **Computer Simulation of Physiological Processes** (3) C. Tidball

Lecture 1 hour a week; practical experience at student's convenience. Programming of physiological simulation will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball

Readings in physiological simulations and their evaluation. Informal discussions at regular intervals. Prerequisite: Phyl 271 or equivalent or permission of instructor. May be repeated once for credit.

295 **Research** (arr.) Staff
By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

298 **Comprehensive Physiology** (arr.) Staff
Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

396 **Advanced Reading and Research** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of Physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) Staff
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

POLISH

See Slavic Languages and Literatures.

POLITICAL SCIENCE

Professors R.E. Purcell, H.L. LeBlanc, B. Nimer, A. Gyorgy, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich *(Chairman)*, Y.C. Kim, S.J. Wayne, J.M. Logsdon
Adjunct Professor W.H. Lewis
Associate Professors C.F. Elliott, C.A. Linden, H.R. Nau, R.L. Cole
Assistant Professors S. Shaffer, C. McClintock, M.J. Sodaro *(Visiting)*, S.L. Wolchik, J.R. Henig, D.E. Pollock *(Visiting)*, C.J. Deering, S.S. Smith
Instructors E.A. Peterson, S.J. Carroll
Lecturer C.B. Gass

Bachelor of Arts with a major in political science (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite: PSc 1 and 2. Six courses in the social sciences, other than political science, to include six hours of history or six hours of economics. Twelve semester hours of introductory foreign language and statistics are strongly recommended.

3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement which consists of six semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 109, 110. Group B (American government and politics)—PSc 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 124. Group C (comparative government and politics)—PSc 130, 131, 146, 165, 168, 170, 173, 177, 179, 180, 181, 183. Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 178, 182, 184.

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete at least one pro-seminar (PSc 191 or 192) or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program; such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the permission of the instructor and the undergraduate coordinator. Completion of, or concurrent enrollment in, a methodology course (PSc 101, 102, or 104) is a prerequisite to the proseminars or 200-level courses.

The Department also offers a major with a public policy focus. Students who wish to concentrate in public policy must distribute their 30 hours in political science as follows: 3 semester hours from each of Groups A, B, C, D; PSc 104; 9 semester hours in policy-oriented courses to be selected from a group designated by the program advisor; and one policy-oriented proseminar.

Up to 12 hours of either service-learning or internship credit may be applied towards a degree. No more than six hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90-semester-hour degree program (see page 83) must receive grades of *A* in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements (see page 50) and take at least one political science honors seminar in which an independent study project is completed with distinction. The project is reviewed by a Departmental Honors Committee. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, and have achieved a QPI in the major of at least 3.5 as juniors or at least 3.3 as seniors. PSc 101 may not be taken concurrently with the honors seminar.

Minor in political science—Required: 15 semester hours of second-group political science courses, plus 9 hours of other social science courses. At least 3 hours must be taken in each of the groups listed under the requirements for a B.A. in the field of political science, item 3.

Master of Arts in the field of political science—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required: The general requirements, pages 91–99, and either a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to six semester hours), and the satisfactory

completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

All students must take one course chosen from PSc 200, 230, or 240 during the first semester of graduate study. The course selected must have the approval of the coordinator of graduate studies.

Doctor of Philosophy in the field of political science—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required: The general requirements, pages 91–93, 99–101. Each student must complete a General Examination, which covers a major and minor field of study.

PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from four principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist-Leninist thought, and scope and methods of political science); (2) comparative and foreign politics (comparative political analysis, regional comparative politics, and domestic politics of a specified major political system); (3) international relations (international politics, international law, international organization, regional international relations, and foreign relations of a specified major political system); and (4) American politics (American political process, national policy-making process, American constitutional law and judicial process, science policy, and state, local, and urban politics). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

Departmental prerequisite: PSc 1 and 2 (or their equivalent) are prerequisite to all second-group courses in political science.

First Group

1 Introduction to Comparative and International Politics (3) — Gyorgy, Nau, McClintock, Sodaro

Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies. (Fall and spring)

2 Introduction to American Politics and Government (3) — Purcell, LeBlanc, Wayne, Cole, Morgan

Structure, powers, and processes of the American political system. (Fall and spring)

3 Introduction to Political Behavior (3) — Gass

Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions. May be taken only with joint registration in Hum 3. (Fall)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Scope and Methods of Political Science** (3) Kim, Cole, Shaffer, Carroll, Smith
Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3) Cole, Shaffer
Extensive examination of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

104 **Methods of Public Policy Analysis** (3) Henig, Carroll
Models and case studies of public policy formation and changes, techniques of policy analysis and evaluation, normative implications of alternative policy-making frameworks. (Spring)

105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden
Foundations of Western political thought—Plato to Aquinas. (Fall and spring)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau. (Fall and spring)

107 **Issues in Modern Political Thought** (3) Linden, Wolchik
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall)

108 **Modern Communist Ideologies** (3) Elliott
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on the careers and ideas of leading figures: Marx, Engels, Lenin, Stalin, Khrushchev, and Mao. (Spring)

109 **Democratic Theory** (3) Staff
Issues of recent democratic thought and theory, particularly in relation to the contemporary American political process. (Fall)

110 **American Political Thought** (3) Morgan
Political thought in the U. S. from colonial times to the present as seen through major representative writings. (Spring)

111 **State and Urban Politics** (3) Cole, Henig
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

* An interdepartmental course offered by the Political Science, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Religion Departments.

112 State and Urban Policy Problems (3) Cole, Henig

Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings. (Spring)

113 Policy and Politics of Intergovernmental Relations (3) Cole

Analysis of relationships among national, state, and local governments. Emphasis on the policy consequences of intergovernmental relations and the emerging federal system. (Fall)

114 U.S. Constitutional Law and Politics I (3) Morgan

Separation of powers, federal-state relationships, economic regulation. (Fall)

115 U.S. Constitutional Law and Politics II (3) Morgan

Political and civil rights. (Spring)

116 The American Presidency (3) Wayne

Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance. (Fall and spring)

117 Public Administration and Bureaucratic Politics (3) Staff

Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Spring)

118 Legislative Process (3) Deering, Smith

Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive-legislative relations and interest-group activities. (Fall and spring)

119 U. S. Political Parties and Politics (3) LeBlanc

Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches. (Fall and spring)

120 Public Opinion and Political Socialization (3) Carroll

Sources of mass political attitudes and behavior; voting and political campaigning. (Fall)

122 Science, Technology, and Politics (3) Logsdon

Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring)

124 Issues in Domestic Public Policy (3) Cole, Henig

Current status of governmental programs dealing with various social problems in such areas as health, crime, poverty, education, and transportation. (Fall or spring)

129 TV News: The Politics of Visibility (3)

Joint offering of the Departments of Journalism, Political Science, and Speech and Drama. Examination of the impact of television on American politics and society, the nature of coverage of political issues and campaigns, the dynamics of selecting and presenting news stories. (Fall and spring)

130 **Comparative Government and Politics I** (3) — Kim, McClintock, Peterson

Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 **Comparative Government and Politics II** (3) — Gyorgy, Hinton, Elliott, Sodaro, Wolchik

Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 **International Politics** (3) — Nau, Shaffer

International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 **International Organizations** (3) — Nau, Stambuk

Development and operations of the United Nations, regional organizations, and functional international organizations. (Fall and spring)

144 **Public International Law** (3) — Staff

Survey of international law; emphasis on development and trends. (Fall and spring)

146 **U. S. Foreign Policy** (3) — Purcell

Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)

149 **Military Force and Foreign Policy** (3) — Sapin, Lewis

Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall)

161 **European-Atlantic Relations** (3) — Stambuk

International politics of the North Atlantic area, the European Common Market, and U.S.-European relations. (Fall)

165 **Government and Politics in Eastern Europe** (3) — Gyorgy

Study of the contemporary social and ethnic structures, governmental systems, and international position of the Eastern European states within the Soviet system. (Summer)

168 **Soviet Foreign Policy** (3) — Elliott

Relations with U. S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of China and Japan** (3) — Hinton

Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts. (Fall)

173 **Governments and Politics of South and Southeast Asia** (3) — Hinton

Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia. (Fall)

177 **Governments and Politics of the Middle East** (3) Reich, Pollock
Politics of the eastern Arab states, Turkey, Iran, Israel. (Fall)

178 **International Relations of the Middle East** (3) Reich, Pollock
Analysis of the regional and international relations of the Middle East. (Spring)

179 **Israeli Foreign Policy** (3) Reich
Examination of the institutions, processes, and issues of Israeli foreign policy. (Fall)

180 **Governments and Politics of North Africa** (3) Reich, Lewis
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring)

181 **Politics of Middle and Southern Africa** (3) Nimer
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3) Nimer
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent. (Spring)

183 **Governments and Politics of Latin America** (3) McClintock
Political processes and institutions in Latin America, particularly Mexico, Chile, Peru, Brazil, and Cuba. Emphasis on issues of reform and revolution. (Fall)

184 **International Relations of Latin America** (3) McClintock
U. S.-Latin American relations, inter-American diplomacy and organization, foreign policies of selected states. (Spring)

*187 **Internship: Political Behavior** (3) Deering
Study of political behavior through internship experience with Congress, executive departments or agencies, politically active private-sector groups, political parties, or electoral campaigns. May be repeated for credit with approval. (Fall and spring)

*188 **Internship: Urban Affairs** (3 or 6) Henig
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. (Fall and spring)

*189 **Internship: Legal Process** (3 or 6) Wallace
The legal system and its role in promoting social change. Readings, group discussions, and work with lawyers and third-year law students. (Fall and spring)

190 **Selected Topics in Political Science** (3)
(Fall and spring)

*191 **Proseminar: International Affairs** (3 or 6) Sapin, Reich
Examination of selected problems in international relations. (Fall and spring)

* Admission requires departmental approval.

*192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. (Fall and spring)

*193 **Proseminar: Urban Affairs** (3 or 6) Henig
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. (Fall and spring)

*196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

*199 **Honors Seminar: International Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101.

Third Group

200 **Scope and Methods of Political Science** (3) Linden, Shaffer, Carroll, Smith
Introduction to the discipline and profession, analysis and comparison of some approaches to political inquiry, and empirical research design. (Fall and spring)

201 **Empirical Political Analysis** (3) Cole, Shaffer, Carroll, Smith
Techniques of social science data analysis. Emphasis on using computers for statistical analysis in political research. No previous experience with statistics or computers required. (Fall)

202 **Advanced Topics in Empirical Political Analysis** (3) Cole, Shaffer
Advanced techniques of data collection and analysis; varying emphasis on such methods as casual modeling, analysis of variance, regression analysis, and simulation. (Spring)

203 **Public Policy Analysis** (3) Henig, Carroll
Reading and research on systematic methods of public policy analysis. (Spring)

205 **Readings in Political Theory** (3) Linden
Selected major works, both ancient and modern, which illuminate basic problems and questions of political theory. (Fall)

206 **Topics in Political Theory** (3) Linden
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)

207 **Readings in Socialism and Communism** (3) Elliott, Linden, Wolchik
Readings and discussions of works illuminating the development of pre- and post-Marxian socialist thought. (Fall)

208 **Readings in Marxism-Leninism** (3) Elliott, Linden
Readings and discussions in Marxism-Leninism and its controversies from Lenin to the present. (Spring)

* Admission requires departmental approval.

209 **Democratic Theory** (3) Staff
Readings and discussions in democratic theory. Attention to recent work toward formulation of adequate theory in American political science. (Fall or spring)

210 **American Political Thought** (3) Staff
Readings and discussions. Analysis and evaluation of major intellectual sources of American political thought.

211 **State Politics** (3) Cole, Henig
Comparative analysis of American state politics, including state political institutions and policy-making processes, state policy choices, and the state role in the federal system. (Fall)

212 **Urban Politics** (3) Cole, Henig
The socioeconomic, demographic, and cultural context of urban politics; informal patterns of power and influence in urban decision-making; formal institutions and policy-making processes; urban policies and their impacts. (Spring)

213 **Intergovernmental Relations** (3) Cole
Analysis of the fiscal, structural, social, and political aspects of the evolving federal system; emphasis on metropolitan government. (Fall)

214 **Topics in Constitutional Law** (3) Morgan
Lectures and group discussions on constitutional law and politics. (Fall, even years)

215 **Judicial Policy-making** (3) Morgan
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. (Fall, odd years)

216 **American Presidency** (3) Wayne
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making. (Fall)

217 **Bureaucratic Politics** (3) Staff
Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy. (Spring)

218 **Legislative Theory and Behavior** (3) Deering, Smith
Organization, behavior, and policy outputs of the U.S. Congress. (Spring)

219 **American Political Parties and Electoral Behavior** (3) LeBlanc
Nature and functions of political parties, with special emphasis on party influences on electoral behavior and congressional decision-making. (Fall)

220 **Public Opinion and Political Socialization** (3) Carroll
Sources and dynamics of public opinion and political socialization. (Spring)

222 **Government, Science, and Technology** (3) Logsdon
National and international policy issues which arise from the inter-

action between scientific and technological development and governmental activity. (Fall)

223 **Science, Technology, and Public Affairs** (3) Logsdon
Intensive examination of selected public policy issues with significant scientific or technological aspects. Prerequisite: PSc 222 or permission of instructor. (Spring)

230 **Comparative Government and Politics I** (3) Kim, McClintock, Peterson
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, McClintock, Peterson
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

232 **Comparative Communist Systems I** (3) Wolchik
Joint offering of the History and Political Science Departments. Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on the Soviet Union and Eastern Europe. (Fall)

233 **Comparative Communist Systems II** (3) Wolchik
Joint offering of the History and Political Science Departments. Comparative analysis of the political history and contemporary political processes of communist states, with emphasis on China and Cuba, and non-ruling communist parties. (Spring)

240 **Theories of International Politics I** (3) Nimer, Shaffer
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Shaffer
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

242 **Problems in International Organizations I** (3) Nau, Stambuk
Collective security, law, and the politics of international organizations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
Social and economic interdependence and the politics of international organizations. (Spring)

244 **International Law I** (3) Staff
Readings in selected areas. (Fall)

245 **International Law II** (3) Staff
Research in selected areas. (Spring)

246 **U. S. Foreign Policy** (3) Purcell
Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution. (Fall)

247 **Public Opinion and Foreign Policy** (3) Purcel
Research and readings on U.S. public opinion interest groups tha influence foreign policy. (Spring)

248 **U. S. National Security Policy-making** (3) Sapin, Lewi
Executive organization and processes for national security policy making. Attention to relevant theoretical approaches. (Fall)

249 **U. S. National Security Policy** (3) Sapi
Fundamental considerations; selected issues, e.g., arms control an disarmament, regional security problems, military assistance. (Spring)

252 **Science, Technology, and World Order** (3) Nau
Intensive reading, discussion, and research on the impact of scienc and technology on world order, in particular on the claim that new global politics is replacing traditional or nation-state politics (Spring)

260 **Western European Politics** (3) Peterso
Examination of the principal characteristics of the British, French West German, and Italian political systems, comparing their institu tional and behavioral adaptations to the problems of advanced in dustrial democracies. (Fall)

261 **Problems in Transnational and Comparative Politics of Western Europe** (3) Stambuk, Peterso
National and supranational political processes in Western Europe emphasis on interest aggregation and articulation, interbureaucrati relations, and selected policy outcomes in the context of the Euro pean Common Market.

263 **Communism in Non-Communist Europe** (3) Sodar
Examination of non-ruling European communist parties; relations be tween these parties and other ruling and non-ruling communis parties.

264 **The International Politics of Eastern Europe** (3) Gyorgy and Staf
Major historical, political, social, and regional factors which hav shaped the inter-war, World War II, and post-war evolution o Eastern Europe; emphasis on foreign relations with outside power and on regional East-West contacts. (Spring)

265 **Governments and Politics of Eastern Europe** (3) Gyorgy and Staf
A comparative study of Eastern European states: political, socia economic institutions; emphasis on domestic conditions and problem of individual Eastern European countries. (Fall)

266 **Readings in Soviet Government and Politics** (3) Elliott, Linde
Readings in contemporary Soviet domestic government and politics (Fall)

267 **Soviet Government and Politics** (3) Elliott, Linden, Wolchi
Research seminar in selected problems of Soviet domestic govern ment and politics. Emphasis: since Stalin. Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) Elliott
External problems and policies of the USSR, with emphasis on the period since 1960. Relations with other communist states, Western powers, other countries, and non-ruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) Wolfe, Elliott
Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought. (Fall or spring)

270 **Politics of the People's Republic of China I** (3) Hinton
Introduction to the substance of and literature on contemporary Chinese politics. Discussion and reading. (Fall)

271 **Politics of the People's Republic of China II** (3) Hinton
Research seminar. Introduction to the analysis of official Chinese documents; presentation of student papers. (Spring)

272 **Foreign Policy of the People's Republic of China** Hinton
Objectives; formulation and implementation; the People's Republic of China as Asian state, revolutionary influence, would-be great power. (Spring)

273 **Governments and Politics of South and Southeast Asia** (3) Purcell
Research and selected readings as basis for analysis of structure, problems, and policies of the governments of selected countries; particular reference to India. (Spring)

274 **Southeast Asia in World Politics** (3) Staff
Southeast Asia in great-power perspective. Balance-of-power concept and development of Asian subsystem. (Spring)

275 **International Politics of the Far East** (3) Hinton
Foreign policies and international behavior of the regional states (especially China, Japan, and Vietnam) and the extraregional powers (especially the U.S. and the U.S.S.R.). (Fall)

276 **Governments and Politics of Japan and Korea** (3) Kim
Readings and research on the domestic and foreign policies of Japan, North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) Reich, Pollock
Readings and research on selected problems of the governments and politics of the Middle East. (Fall)

278 **International Relations of the Middle East** (3) Reich, Pollock
Readings and research on the regional and international relations of the Middle East. (Spring)

280 **Governments and Politics of North Africa** (3) Reich, Lewis
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Spring)

281 **Topics in African Politics** (3) Nime
Readings, research, and discussion of selected aspects of Africa domestic and international politics. (Spring)

283 **Governments and Politics of Latin America** (3) McClintoc
Readings and discussion on politics in Latin America, particular Mexico, Chile, Peru, Brazil, and Cuba. Emphasis on issues of refor and revolution. (Fall)

284 **International Relations of Latin America** (3) McClintoc
Readings and discussion on U.S.-Latin American relations and th foreign policies of selected states. (Spring)

285 **Problems in Latin American Civilization** (3) Staf
Interdisciplinary seminar partially guided by a specialist in th methodology of his/her chosen discipline; each student writes report on some aspect of a selected key theme. Admission by per mission of instructor. (Spring)

286 **Selected Topics in American Politics** (3) Staf
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staf
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staf
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staf
Readings and discussion. (Fall or spring)

290 **Colloquium: Middle East** (3) Reich
Interuniversity colloquium for advanced students of Middle East af fairs. Admission by permission of the instructor. (Fall and spring)

291 **Colloquium: East Asia** (3) Hinto
Interuniversity colloquium for advanced students of Far Eastern affairs. Admission by permission of the instructor. (Fall and spring)

292 **Colloquium: Russia and Eastern Europe** (3) Gyorg
Interuniversity colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor (Fall and spring)

297 **Reading** (3) Staf
Limited to master's degree candidates. Written permission of in structor required. (Fall and spring)

298 **Research** (3) Staf
Limited to master's degree candidates. Written permission of in structor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staf

Fourth Group

301 **Advanced Reading and Research in Political Theory** (3) Staf

310 **Advanced Reading and Research in American Politics** (3) Staff

340 **Advanced Reading and Research in Comparative Politics** (3) Staff

350 **Advanced Reading and Research in International Politics** (3) Staff

397 **Advanced Reading** (3) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (3) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (3) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PORTUGUESE

See **Romance Languages and Literatures.**

PSYCHOLOGY

Professors T. Hunt *(Emeritus)*, E.L. Phillips, J.N. Mosél, B.I. Levy, W.E. Caldwell, R.D. Walk *(Chairman)*, R.K. White *(Emeritus)*, A.D. Kirsch, E. Johnson *(Emeritus)*, V. Kirkbride *(Emeritus)*, C.E. Rice, E. Abravanel, D.E. Silber, J. Miller, C.J. Lange, A.J. Caron *(Research)*
Adjunct Professors R.F. Caron, J.B. Margolin
Professorial Lecturers R.K. Kahn, S.L. Cohen
Associate Professors C.E. Tuthill, R.H. Tanck *(Research)*, S.A. Karp, R.W. Holmstrom, L.A. Rothblat, F.L. Schmidt *(Research)*, P.J. Poppen, L. Brandt
Adjunct Associate Professor, D.G. Kleiman
Associate Professorial Lecturer E.C. Stewart
Assistant Professors S.K. Green, A.R. Bruhn, S. Hashtroudi

Clinical Training Staff

Clinical Professor J. Borriello
Associate Clinical Professors I.M. Zimmerman, J.W. Cummings, M.E. Zedek, E. Blum, P.D. Daen, D.A. Evans

Bachelor of Arts with a major in psychology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses—seven or eight semester hours selected from Psyc 1, 5 and 6.
3. Required courses in related areas:

(a) three semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 6. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 9 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 113, 151 recommended), political science or sociology, of which six hours must be

from one of the following: anthropology, economics, history, political scienc or sociology. If a student takes more than six hours in any one departmen the excess will be credited to electives.

4. Required courses in the major—27 semester hours in second-group psy chology courses, including Psyc 196 and one course from each of the following groups—*Group A:* Psyc 118, 121, 161; *Group B:* Psyc 115, 144, 151, 156; *Group C* Psyc 101, 129, 131; *Group D:* Psyc 110, 112, 132.

It is recommended that students contact their academic advisors as soon a possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplatin graduate study are reminded that most graduate schools require knowledg of one and sometimes two foreign languages.

To qualify for graduation with Special Honors the student must fulfill th general requirements (see page 50), take an honors seminar (Psyc 197), an complete an independent study project (Psyc 191) with distinction. The grad point average in psychology required for graduation with Special Honors is 3.3

Minor in psychology—18 semester hours are required, including Psyc 1 an at least 9 semester hours of second-group psychology courses. Students con sidering graduate study in psychology are advised to take Psyc 5 or 6, a distri bution of courses from categories A, B, C, D above, Psyc 196, and an elementar course in statistics.

Master of Arts in the field of psychology—Prerequisite: the degree of Bache lor of Arts with a major in psychology at this University, or an equivalen degree. Admission to the program is limited; preference will be given thos who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements, pages 91–99. Of the 24 required se mester hours (exclusive of the thesis), a minimum of 18 must be in third-grou psychology courses including Psyc 202 and either 203 or 204; six may be in related fields approved by the department. For detailed requirements consul the chairman of the department.

Doctor of Philosophy in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Mille Analogies Test and the Aptitude Test of the Graduate Record Examination are required for admission.

Required: the general requirements, pages 91–93, 99–101, including (1) the satisfactory completion of the tool requirement; (2) Psyc 202, 203–4, Stat 105 and (3) the satisfactory completion of a Preliminary Examination and a major Field Examination.

Areas of study: clinical, developmental, experimental, industrial and organizational, and social psychology.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of instructor students may elect Psyc 5–6 in the freshman year.

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

First Group

1 General Psychology (3) Staff

Fundamental principles underlying human behavior. (Fall and spring)

5–6 **Principles and Methods of Psychology** (4–4) Walk, Hashtroudi
Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, $6 per semester. (Academic year)

8 **Psychology of Motivation and Personality** (3) Tuthill, Bruhn, Karp
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 **Introduction to Educational Psychology** (3) Kirkbride, Tanck
The contributions of psychology to education; emphasis on learning. (Fall and spring)

29 **Psychology of Childhood** (3) Brandt, Bruhn
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world. (Fall and spring)

Second Group

101 **Abnormal Psychology** (3) Silber, Holmstrom, Bruhn
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)

104 **Ecology and Mental Health** (3) Karp
Examination by field research of the linkages between aspects of the physical environment and mental health. Lectures and student field research projects. (Fall)

105 **The Psychology of Consumer Behavior and Attitudes** (3) Phillips
Consumer behavior and attitudes in regard to advertising, buying habits, consumer action groups and social pressures, and mass persuasion. Lectures and field work. (Spring)

108 **Humanistic Psychology** (3) Mosél
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations, existential and phenomenological psychology, the new mentalism. (Spring)

110 **Perception and Understanding in Children** (3) Abravanel
Concepts and research in the area of developmental psychology; emphasis on the growth and development of perception, cognition, and language. (Spring)

112 **Psychology of Adolescence** (3) Bruhn, Johnson
Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems. (Fall and spring)

115 **Psychology of Language and Communication** (3) Mosél
Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar theory, cultural and linguistic structures in the perception and learning of language. (Fall and spring)

117 Psychology of Art and Picture Perception (3) Wall
Principles of perception as applied to art. Theories of Arnheim Gibson, Gombrich, and Goodman as related to art and picture per ception; study of cross-cultural research and research with children

118 Neuropsychology (3) Rothbla
Analysis of neural processes underlying behavior. Basic structur and functions of the nervous system, with emphasis on sensory processes, learning and memory, motivation, and emotion. (Fal and spring)

119 Group Dynamics (3) Mille
Relationship of the individual to groups, collectivities, and large social systems. Theory, research, and applications of group an organizational processes, emphasizing contributions of Freud, Lewin Bion, Mills, Slater, Mann, Miller and Rice. Enrollment limited (Spring)

121 Psychology of Learning (3) Hashtroud
Theories and issues related to basic learning processes as determi nants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 Psychology and Human Relations (3) Silbe
Understanding human relations and T-group techniques by evolving an on-going T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

124 Aggression: Its Nature and Determinants (3) Abravanel
Study of research with adults, children and animals; influence of mass media and cultural comparisons in handling and channeling aggression. Examination of contemporary theories of aggression.

129 Theories of Personality (3) Karp, Poppen
Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 Seminar: Political and Social Implications of Current Approaches to Psychological Treatment (3) Karp
Discussion and presentation of recent works, such as those of Szasz, Goffman and various writers on minority liberation, bearing upon the implications for individuals and society of various approaches to psychological treatment, including psychotherapy and behavior modification.

131 Psychological Tests (3) Hunt, Karp, Holmstrom
Survey of psychological tests and their more common uses in busi ness, industry, government, law, medicine, and education. Material fee, $7. (Fall and spring)

132 Socialization in Childhood (3) Brandt
Examination of primary methods by which the child is shaped in terms of social judgment and self control; internalization of con trols, assimilation of societal values and parenting procedures. Or ganized by focus on issues according to developmental level.

135 **Freud and Modern Psychoanalysis** (3) Miller

Introduction to the work of Freud and his impact on modern psychoanalysis, focusing on the meaning of dreams and the unconscious function of conflict and defense, infantile sexuality and the Oedipus conflict, development of the ego, theory of anxiety and neurosis, and the death instinct. (Spring)

144 **Personnel and Industrial Psychology** (3) Cohen, Mosél

Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity. (Fall and spring)

150 **Psychology of Sex Differences** (3) Poppen

Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3) Tuthill, Poppen, Green

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism and war. (Fall and spring)

154 **Psychology of Criminology** (3) Silber

Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior. (Fall)

156 **Psychology of Attitudes and Public Opinion** (3) Tuthill

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare. (Spring)

158 **Psychology of Interpersonal Attraction** (3) Green

Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches and effects of attraction on other behavior.

161 **Comparative Psychology** (3) Caldwell

Lectures and demonstration on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology. (Spring)

168 **Principles and Techniques in Neuropsychological Research** (3) Rothblat

Introduction to basic anatomical, physiological and behavioral techniques used in neuropsychological research to explore relationships between the brain and behavior. Admission by permission of instructor. Laboratory fee, $20. (Spring)

170 **Clinical Psychology** (3) Levy

An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. **Prerequisite:** Psyc 101, 131. (Spring)

188 **Attitudes toward Death and Dying** (3) Sta
Exploration of the many different aspects, attitudes, and experienc associated with the process of death and dying. Limited to junio and seniors.

191 **Independent Research in Psychology** (3) Sta
Opportunity for work on individual library or experimental projec Open to qualified students by permission; arrangements must b made with the sponsoring faculty member prior to registratio May be repeated once for credit. (Fall and spring)

192 **Field Experience in Psychology** (3) Abravan
Senior psychology majors will spend a minimum of six hours a wee in a local mental health, rehabilitation, school, or community settin Students registering for this course must have prior approval of th instructor. (Fall and spring)

196 **History and Systems of Psychology** (3) Caldwell, Ric
Senior capstone course which includes a survey and integration o the major viewpoints and concepts of psychology. Required psychology majors. (Fall and spring)

197 **Honors Seminar in Psychology** (3) Sta
Selected topics in psychology which change from semester to se mester. Intended primarily for juniors who plan to enroll in Psy 191 (independent research) in the senior year. May be repeated fo credit.

198 **Current Research Issues in Psychology** (3) Sta
Conducted as a seminar. Recent experiments in psychology, inclu ing those performed by members of the class; emphasis on studen participation. May be repeated for credit.

Third Group

Third-group courses are limited to graduate students in psychology, except b special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstro
Required in all graduate psychology programs. Prerequisite: gradua standing, a laboratory course in psychology, and an elementar course in statistics. (Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat and Sta
Required of doctoral students in psychology during first year study. Psyc 203: basic issues in learning and motivation. Psyc 20 physiological processes; sensation and perception. [Academic yea

205 **Research Methods in Intervention Programs** (3) Kar
Special problems of conducting research in a clinical setting; em phasis on content and method of studies designed to assess effec of therapeutic intervention. Prerequisite: Psyc 202. [Fall]

206 **Methods of Clinical and Personality Research** (3) Ric
Review of techniques especially relevant to research in clinic personality, and social psychology. Scaling methods, multivaria

techniques, introduction to the use of computers in data analysis. Prerequisite: Psyc 202; Stat 105 or equivalent. (Spring, odd years)

207–8 **Psychological Assessment** (3–3) Holmstrom, Levy, Silber
Open only to clinical graduate students in the Department of Psychology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory—diagnostic work at clinical facilities. Material fee, $7 per semester. (Academic year)

209 **Seminar: Psychology of Motivation** (3) Caldwell
Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Levy
Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $7. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Levy
Methods of personality assessment, primarily the Rorschach. Material fee, $7. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Brandt, Walk
Psyc 213: research and theory in developmental psychology, emphasis on perceptual and cognitive development; consideration of the development of social awareness and of genetic-biological growth processes. Psyc 214: current research and theory in perceptual, cognitive, and social development; intensive study of selected research problems. (Academic year)

215 **Personality Assessment by Multiple Procedures** (3) Brandt, Bruhn
Consideration and use of a wide range of procedures in assessment of personality and psychopathology of children. Prerequisite: Psyc 207–8 or 211 and 212. Graduate students in fields other than psychology admitted by permission of instructor. Material fee, $7.

216 **Psychological Assessment by Graphic Means** (3) Levy
Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Silber
Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. (Summer)

219 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Lewin, Bion, Mills, Slater, Mann, Miller and Rice. Enrollment limited. (Spring)

220 **Seminar: Abnormal Psychology** (3) Miller
Study of selected problems of psychopathology. (Fall)

221–22 Seminar: Group Psychotherapy (3–3) Borriell

For graduate students in the clinical psychology program. Open t others if space permits and with permission of instructor. Psyc 22 survey of group therapy approaches; Psyc 222: supervised experienc with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. (Ac demic year)

223 Seminar: Learning (3) Hashtroud

Selected topics of current research interest in the psychology o learning. (Spring)

225 Seminar: Child Psychotherapy (3) Brub

Theory and practice of insight-oriented psychotherapy with children Class observation of an ongoing treatment case. Supervised treat ment of a child in a practicum setting. Permission of instructor re quired for all students except graduate students in the child clinica track. (Spring)

226 Seminar: Clinical Psychology of Childhood and Adolescence (3) Brand

For graduate students in psychology; open to others with permissio of instructor, if space permits. Exploration of major topics concern ing psychopathology in children and adolescents; discussion o nosological issues with emphasis on theoretical and research litera ture. (Fall)

227–28 Seminar: Principles of Psychotherapy (3–3) Kah

For graduate students in clinical psychology; open to others, with permission of instructor, only if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon Prerequisite: Psyc 218. (Academic year)

229 Seminar: Principles of Behavior Change (3) Phillips

Stimulus-organism-response variables and their interactions, with emphasis on learning theory as applied to clinical problems. (Fall)

231 Development of Psychometric Instruments (3) Mose

Quantitative techniques and principles used in construction, stan dardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for mea surement purposes. Prerequisite: course in tests and measurement and an elementary course in statistics. (Fall)

232 Ego Psychology and Theories of Object Relations (3) Holmstrom

Emphasis on theoretical contributions of Freud, Hartmann, Kris Klein, Rapaport, Kernberg, and others. Assessment and treatment are addressed, primarily with reference to investigations of borderline and characterological disorders. Permission of instructor required for all students except those in clinical psychology. (Spring)

234 Seminar: Theory of Psychological Measurement (3) Mose

Development of classical axiomatic-deductive theory underlying ma jor notions in the construction and evaluation of psychological tests. (Spring)

235 Seminar: Community Mental Health (3) Mille

For graduate students in the Department of Psychology; open to

others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues. Prerequisite: Psyc 219. (Fall)

240 **Seminar: Selected Topics in Psychopathology** (3) Silber
Examination of current research and theory in psychopathology. (Spring)

241–42 **Family Systems: Theory, Practice, and Research** (3–3) Evans
Family dynamics and their implications for assessment and treatment. Special emphasis on the role of research in the process of evaluation of family systems and family therapy. Enrollment limited to advanced doctoral students in clinical psychology. (Academic year)

245 **Seminar: Organizational Behavior** (3) **Mosél**
Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Evaluation Techniques** (3) Mosél, Harper
Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

247 **Seminar: Psychological Tests and Equal Opportunity** (3) Hunt
Technical, professional, practical, and legal demands of psychological test use. Current problems of fairness, discrimination against minorities, and test validation. (Summer)

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Cohen
Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. (Spring, even years)

249 **Organizational Behavior Modification** (3) Mosel
Application of operant and other behavioristic principles to changing individual and group performance in organizations. Contingency management and organizational development. New approaches to intrinsic job motivation based on covert reinforcement theory. (Spring—alternate years)

251 **Seminar: Advanced Social Psychology** (3) Tuthill, Poppen, Green
Current research and theory: motivation and cognition, dissonance, social interaction theory, interpersonal processes, group dynamics, group conflict. (Fall)

252 **Research Methods in Social Psychology** (3) Tuthill, Poppen, White, Green
Selected methods such as public opinion polling, attitude scaling, interviewing, content analysis, naturalistic observation, field research or laboratory experimentation. May be repeated for credit. (Fall and spring)

254 **Seminar: Experimental Social Psychology** (3) Tuthi

Experimental study of small groups, group climates, interacti process analysis. Lewin's field-theoretical approach to individual a group processes. (Spring, odd years)

257 **Current Topics in Social Psychology** (3) Poppen, Gree

Advanced seminar with focus on major theoretical approaches, r search, or problem areas within field of social psychology. Top changes each semester. (Fall and spring)

258 **Seminar: Attitude Change** (3) Tuthi

Review of recent research literature on attitude formation a change. Examination of theories of attitude change and experiment findings. (Spring, even years)

261 **Seminar: International Communication** (3) Mosél, Stewa

Primarily for students in the School of Government and Busines Administration and School of Public and International Affairs. Co munication information and effecting attitude change across culture interpersonally and by mass media.

263 **Evaluation Research** (3) Ric

Research issues and methods in evaluating the impact of social p tervention and service programs, especially those in mental healt Specification of program goals and effectiveness criteria; measur ment problems; experimental and quasi-experimental designs; p litical problems surrounding evaluation research. (Spring, eve years)

268 **Seminar: Neuropsychology** (3) Rothbla

Selected problems in research relating the brain and behavior. I dependent topics each semester such as sensory processing, brai development and behavior, clinical aspects of nervous system fun tion.

272 **Seminar: Theories of Personality** (3) Caldwel

Emphasis on theoretical problems and methodology in the field personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Caldwe

Synthesis of the principles and findings of ethology and comparativ psychology. Examination of the theories and findings of Loren Tinbergen, and Jakob von Uexküll in the light of recent experiment investigations. (Fall, even years)

289 **Seminar: Current Topics in Experimental Psychology** (3) Staf

Review and discussion of contemporary research and theory in specialized field of psychological study, by leaders in the field. I dependent topics each semester; may be repeated for credit. (Fa and spring)

291 **Theories of Organizational Behavior** (3) Cohe

Examination of current theoretical models and research. (Spring odd years)

292 **Seminar: Perception** (3) Wal

Study of current research and theory in the experimental psycholog of perception. (Spring)

293 **Seminar: Psychology of Thinking** (3) Staff

Review of basic theoretical positions and research concerning the processes of cognition: memory, concept formation, and reasoning.

295 **Independent Research in Psychology** (3) Staff

Individual library or experimental research under supervision of staff member. Arrangements must be made with sponsoring faculty member prior to registration. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy major field examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PSYCHIATRY AND BEHAVIORAL SCIENCES

The following course, offered by the Department of Psychiatry and Behavioral Sciences in the University's School of Medicine and Health Sciences, is open to advanced graduate students in clinical psychology. For detailed description, consult the *School of Medicine and Health Sciences Bulletin*.

365–66 **Seminar: Clinical Introduction to Family Diagnosis and Therapy** (3–3)

PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

Professors D.S. Brown, W. Sommers *(Emeritus)*, S.R. Chitwood
Professorial Lecturers J.L. Westrate, N. Beckman
Associate Professors M.M. Harmon, B.L. Catron, A.E. Merget, S. Tolchin, C.W. Washington *(Chairman)*
Assistant Professor W.C. Adams

Programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 134–64).

Third Group

205 **Introduction to Public Administration and Management** (3) Brown, Harmon

Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

213 **Administration in the Federal Government** (3) Tolchin, Westr
Critical analysis of the structure and administration of the fede
government from both a managerial and political perspective. Empl
sis on executive branch organization, integration, and coordinati
as well as current trends in government regulation, accountabili
and effectiveness. (Fall and spring)

215 **Law and the Public Administrator** (3) Chitwo
Exploration and analysis of the functions of law in a democra
society. Emphasis is placed upon the procedural, historical a
jurisprudential dimensions of American law. This broad perspecti
seeks to convey understanding of the law as a legal and moral for
guiding and constraining public decision making. (Spring)

217 **Seminar: Development Administration I** (3) Sta
The nature of underdevelopment. Specific problems of less d
veloped countries. National cultures and political and administrati
systems. The giving of assistance: types of foreign aid; problems
working with aid givers.

218 **Seminar: Development Administration II** (3) Brow
Problem of the transfer of administrative capability from one cou
try to another. Political and administrative development. Unilater
and multilateral approaches. The role of the innovator. Strategies
administrative development.

221 **Organization Theory and the Public Sector** (3) Catron, Harmon, Washingto
Analysis of organization theory with special focus on public organi
zations; current issues in organization theory; decision-making, th
organizational environment and the changing nature of organizatio
in a post-industrial society. (Fall and spring)

223 **Behavioral Factors in Large and Complex Organizations** (3) Brow
Analysis of the nature and characteristics of large organizations
Bureaucracies and their behavioral patterns; dysfunctionalism. Ap
proaches to policy guidance and leadership, particularly in larg
public organizations; influence and control systems. Future trend
(Fall and spring)

231 **Public Personnel Administration** (3) Sta
Basic principles, legislative and judicial background, and current
significant practices in personnel administration in the public servic
Roles of recruitment, selection, wage and salary administration, em
ployee development, and other personnel functions. (Fall)

232 **Problems in Public Personnel Management** (3) Sta
Analysis of major personnel management problems in government
labor-management relations, affirmative action for equal employme
opportunity, impact of legislation and court decisions on trends i
personnel policies, and other continuing problems. (Fall an
spring)

233 **Seminar: Manpower Development and Utilization** (3) Sta
Examination of public and private manpower trends, problems, poli
cies, and programs. Exploration of approaches, old and new, to
the administration of manpower programs. Analysis of impact o
economic, political, and social factors on manpower.

235 **Seminar: Technology Change and Professional Human Resource Planning** (3) Roman

Addresses human resource problems arising from automation and other technological changes. Evaluation of these developments in government, business, and educational organizations, and their implications for productivity, employment, training, and education. Analysis of economic, political, and social factors influencing public and private human resource policies. (Spring)

236 **Labor-Management Relations in the Public Sector** (3) Staff

Principles and current issues in public sector labor relations; collective bargaining and the merit concept, scope of bargaining, representation elections, unfair practices, grievance procedures, bilateralism and the management process.

242 **Administration of State and Local Governments** (3) Washington

Examination of state and local governmental structures and functions, their place within the federal system, their revenue sources, their limitations, and the alternatives available to encourage more effective administration to meet public and private demands. (Fall and spring)

245 **Intergovernmental Relations** (3) Beckman, Washington

Assessment of the impacts and consequences of changes in the administration of intergovernmental policies and programs in the federal system. Legislation, roles and responsibilities of federal, state, regional and local systems will be examined from both theoretical and practical vantage points.

246 **Dynamics of Citizen Participation in Administration** (3) Merget

Review of the basic theory and principles of democracy in the American system of governance. Analysis of the nature of participation in a pluralistic society, including the characteristics and dynamics of citizen-based organizations. Exploration of effective methods or models by which citizens may contribute to administration.

248 **Financing Local Government** (3) Merget

Analysis of the theory and practice of public finance in local governments. Includes the financing of services through municipal taxation, intergovernmental funds, debt instruments, and other revenue sources. (Fall and spring)

249 **Urban Public Policy** (3) Washington

Examination of selected national policies and their effects on urban areas and governments. Emphasis on policy dimensions of urban systems and their relationship to the social, political, and economic context. Against the background of urban politics and administration, areas of health, education, welfare, manpower, transportation, and housing will be addressed. (Spring)

251 **Governmental Budgeting** (3) Staff

Survey of the basic concepts, principles and practices in governmental budgeting; interrelationship of planning, programming, and budgeting; their role in the management process. (Fall and spring)

252 **Public Expenditure Analysis and Planning** (3) Merget

Intensive analysis of the concepts and principles of economics as

applied to the public sector and the analytic techniques used t
government agencies for planning, allocating, and managing scar
resources in the implementation of public programs. Topics discuss
include benefit-cost analysis, program budgeting, productivity, a
performance measurement. (Fall and spring)

253 **Public Financial Management Within Federal Agencies** (3) Ste
Intensive analysis of the concepts, principles, and general practic
of financial management within federal departments and agencie
focusing on the interrelationships of financial and program functio
and drawing on the several financial disciplines of budgeting, a
counting, and auditing.

260 **Policy Formulation and Administration** (3) Harmon, Tolch
Normative and analytical models of the policy process; effects
decision-making and institutional arrangements on public polic
formulation and implementation. (Fall and spring)

261 **Policy Analysis in Public Administration** (3) Catro
Concepts and issues in public policy analysis. Theoretical problem
encountered in policy analysis. The role and limits of analytic tec
niques in the development, implementation, and evaluation of publ
policy. (Fall and spring)

262 **Seminar: Science, Technology, and Public Policy** (3) Blac
The impact of science and technology upon public administration
terms of both administrative practice and national policies.
(Spring)

264 **Public Program Evaluation** (3) Catro
Theory and practice of program evaluation and evaluative researc
Exploration of scope and limitations of current practice in evaluatio
considering economic, political, social, and administrative factor
Examination of methodological considerations for design, data co
lection, analysis, and dissemination. (Spring)

288 **Field Problem Studies in Public Administration** (3) Staf
Field research and approved internships on selected issues and a
pects of public administration, including specific policy and manage
ment problems arising in governmental agencies and related publi
institutions. Open to Masters students upon completion of 9 hour
toward the degree program and with the consent of the intern c
ordinator. (Fall and spring)

289 **Public Program Management and Policy Implementation** (3) Staf
A review of the diverse concepts and methods in public administra
tion: an analysis and integration of the salient political, economic
managerial, and leadership values and issues in implementing publi
policies. Open only to MPA degree candidates in their final semest
of study; serves as a capstone seminar to the MPA program. (Fa
and spring)

290 **Special Topics in Public Administration** (3) Staf
Experimental course offering; new course topics and teaching meth
ods. May be repeated once for credit.

295 **Research Methods** (3) Adam
Theory and practice in research methodology. Data sources and

gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

296 **Statistical Applications in Public Administration** (3) Adams
Use of statistics and computers in research and program evaluations. Development of basic statistical competency; frequency distribution, sampling, central tendency, variability, correlation, probability, regression; computer assistance. Prerequisite: PAd 295. (Fall and spring)

298 **Directed Readings and Research in Public Administration** (3) Staff
Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.

299 **Thesis Seminar** (3) Staff
Examination of thesis standards, research philosophy and methodology in public administration.

300 **Thesis Research** (3) Staff

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to other graduate students at the discretion of the department or the instructor.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

323 **Seminar: The Large and Complex Organization** (3) Brown
Unique problems of large, complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Merget, Washington
Supervised in-depth study of contemporary literature in selected fields and of research methodology in public administration.

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behavioralism, humanism, existentialism and phenomenology.

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to foundations of public policy with focus on theoretical problems of social action. Interrelation of theory and practice. Decision and management as human actions.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Public Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) St
Limited to Doctor of Public Administration candidates. May be r
peated for credit.

PUBLIC AND INTERNATIONAL AFFAIRS

Programs of study in Chinese language and literature, East Asian studi
(China or Japan), international affairs, Middle Eastern studies, public affai
and urban affairs leading to the degree of Bachelor of Arts, and programs
study in East Asian studies, international affairs, Latin American studie
Middle Eastern studies, public affairs, Russian and East European studie
security policy studies, and science, technology, and public policy leading
the degree of Master of Arts are offered by the School of Public and Inter
tional Affairs (see pages 164–82).

RELIGION

Professors R.G. Jones, H.E. Yeide, Jr. *(Chairman)*, D.D. Wallace, Jr.
Associate Professor A.J. Hiltebeitel
Associate Professorial Lecturer E.S. Jospe
Assistant Professors S.A. Quitslund, D.A. Altshuler
Assistant Professorial Lecturer D.M. Yeager

Bachelor of Arts with a major in religion (departmental)—The following r
quirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students shou
consult the departmental advisor regarding courses to be taken to satis
the requirements for meaningful initiation into the social sciences and th
natural and mathematical sciences.)
2. Prerequisite courses—six hours from among Rel 9, 10, 59, 60.
3. Four required courses in related areas—(a) six semester hours in studies
cultures other than American and English (preferably a foreign language), an
(b) six semester hours in either literature, philosophy, or history.
4. Required courses in the major—thirty semester hours including at lea
twenty-one hours of upper-level courses. Twelve of these hours must be chos
from one of the following religious traditions: Judaism (Rel 103, 107, 113, 11
115, 116, 174, 184), Christianity (Rel 104, 105, 122, 124, 143, 144, 145, 146, 17
religions of India (Rel 157, 158, 159, 160, 162). Appropriate graduate semina
may be approved as substitutions for advanced-level courses. The progra
must include Rel 101 and at least one course in each of the following area
Hebrew Scriptures, New Testament, Eastern religions, Western religions.

An honors thesis course (Rel 191) is available for eligible students.

It is recommended that students include the study of foreign languages
their undergraduate program, including Hebrew for those specializing in Judais
and biblical studies, Greek for those specializing in early Christianity (includi
the New Testament), Sanskrit for those specializing in the religions of Ind
All students expecting to enter graduate school are urged to study French
German.

Minor in religion—Required: a minimum of 18 semester hours in religion,
which at least 6 must be upper-level courses. The minor program will be d
veloped in consultation with the departmental advisor. Rel 101 is recommende
for all participating students.

Master of Arts in the field of religion—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. Of the 24 semester hours of required courses (exclusive of the thesis), at least 12 must be in third-group religion courses; a maximum of nine may be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields (the thesis research must be on one of these three fields) selected from the following: the Old Testament, the New Testament, history of Christianity, Judaism, history of religion in America, modern religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required; however, Hebrew or Greek is acceptable for those students whose thesis area is in the Biblical field and Sanskrit or an Eastern language for those whose thesis area is in the history of religions.

Master of Arts in the field of religious education—Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree. The undergraduate program should have included the following courses or equivalent: Anth 1; Educ 108; Psyc 1, 22, and 29; SpDr 1 or 11.

Required: the general requirements, pages 91–99. Of the 24 semester hours of required courses (exclusive of the thesis), at least six must be in third-group religion courses; a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

Master of Arts in the field of religion and medical care —Prerequisite: (1) the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree; or (3) acceptable academic work required of entering medical students who have not earned a bachelor's degree, but who are pursuing the degree of Doctor of Medicine. Certain courses in this program are offered only through off-campus centers of the College of General Studies. See the *College of General Studies Bulletin*.

Required: the general requirements, pages 91–99. The program of study consists of 36 semester hours of approved course work with or without a thesis. Students must elect course work covering four fields selected from clinical pastoral care, religion, sociology, psychology, health care administration and medicine. The course work in these fields must be distributed as follows: 12 semester hours each selected from two fields and at least six hours in clinical pastoral care. The Master's Comprehensive Examination must cover three fields selected from the list above, one of which, as approved by the department, must be outside of the Department of Religion. Supervised clinical education may be offered as a tool subject in lieu of the required reading knowledge examination in a foreign language.

Master of Arts in the field of history of religions—Hinduism—(Consortium of Universities program). Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia or an equivalent degree.

Required: the general requirements, pages 91–99. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. The Master's Comprehensive Examination must cover the following: methods in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A reading knowledge examination in a foreign language, usually in French or German, will be required, and a student must take at least two semesters of either Sanskrit or

Hindi in addition to the 30 hours of required courses for graduate credit. M complete information regarding courses and requirements is available from program advisor, Associate Professor A. J. Hiltebeitel, Department of Religi

Doctor of Philosophy in the field of American religious history (offered cooperation with the Department of History)—Required: the general requi ments, pages 91–93, 99–101. The General Examination must cover four fie including two from the Department of Religion (history of religion in Amer and either early Christianity or European Christianity since 1500) and two fr the Department of History (generally American social history and one oth

First Group

9 The Hebrew Scriptures (3) Jon
Historical and literary study of the Hebrew Scriptures (Old Tes ment) with consideration of development of religious ideas, insti tions, and outstanding personalities. (Fall and spring)

10 The New Testament (3) Jon
Study of New Testament literature from the standpoint of occasio purpose, dominant ideas, and permanent values. Emphasis on proach, structure, and significance of the Gospels and Epistles. (Fall and spring)

21 Religion and Man's Search for Meaning (3) Yel
Traditional religious concepts, language of contemporary religio amidst modern scientific and secular intellectual tendencies, and t place of religion in today's society. (Fall)

22 Religion and Contemporary Social Issues (3) Yel
Illumination of social problems by ethical reflection; examination ethical perspectives as stimuli and barriers to social change; tec niques for maintaining social values and seeking change. (Spri

23 Judaism: Identities and Ideas (3) Altshul
Exploration of important practices and beliefs in classical and mo ern times; study of people and texts that confront tradition a background.

57 Eastern Spiritual Movements and the Modern West (3) Sta
Impact of Eastern religions on Western culture (mainly British a American) through the widening of cultural horizons, the lure of t East, the popularization of the occult, transcendentalism, the "met physical movements," and the arrival of gurus and other missionari from the East. Modern Western influences on Eastern religions a background.

59 Religions of the East (3) Hiltebeit
Origins, evolution, and contemporary status in historical context primitive religions, Hinduism, Buddhism, Taoism, Confucianism, a Shinto. (Fall and spring)

60 Religions of the West and Near East (3) Walla
History of religion in the ancient world (e.g., Greece) and of Judais Christianity, and Islam, including modern developments. (Fall a Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Theories in the Study of Religion** (3) Staff
Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be approached. Readings and discussion of some of the epoch-making books in the development of the study of religion. (Fall)

103 **The Prophets** (3) Quitslund
Development of the prophetic movement in Israel; cultural, economic, literary, and religious dimensions; elements of lasting value in the prophetic teaching. Study of selected prophets.

104 **The Life and Thought of Jesus** (3) Quitslund
Comprehensive study of the life and teachings of Jesus with critical attention to sources. Quest for the historical Jesus. (Spring)

105 **The Life and Thought of Paul** (3) Quitslund
Backgrounds of early Christianity, first-century religious and social conditions affecting the spread of Christianity, the life and journeys of Paul, Paul's presentation of the Christian faith.

107 **Rabbinic Literature and Thought** (3) Altshuler
Readings of the Mishna, Tosefta, Talmuds, midrashim, and liturgical works in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects. (Fall)

111 **Myth, Epic and Novel** (3) Hiltebeitel
Religious themes and images of the hero and their cultural significance in literature: e.g., Indo-European, Biblical, Babylonian narrative traditions; Greek epic and drama; Dante, Milton, Dostoevsky, Kafka, Hesse, Faulkner, Beckett.

113 **Early Post-Biblical Judaism** (3) Altshuler
History of Judaism from the time of Ezra through the destruction of Jerusalem in 70 CE—canonization of the Pentateuch, Hellenism, Maccabean revolt, growth of sectarian movements, Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings.

114 **Judaism in the Rabbinic Period** (3) Altshuler
From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple; apocalyptic thinking and revolt of Bar Cochba; rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature.

* An interdepartmental course offered by the Departments of Religion, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Political Science.

115 **Judaism in the Medieval World** (3) Altshul
History of relations between Jews and non-Jews. Daily life and edu cation of the ordinary Jew; rabbinical law and interpretation scripture; Jewish philosophers, mystics, sects and messianic move ments. (Fall)

116 **Judaism after Emancipation** (3) Altshul
Transformation of community and beliefs among Jews beginning wit catalyst of their political emancipation. Responses to beginnings modernity among Jews in Europe, America, and Israel. (Spring)

122 **Christian Ethics and Modern Society** (3) Yeid
Nature and principles of Christian life as developed by the Christi community; problems of personal conduct; application to famil social, and economic institutions. (Fall)

124 **Contemporary Movements in Theology** (3) Quitslun
Theological approach and systems of a selected number of moder theologians and/or theological movements such as process theolog liberation theology.

126 **Western Mysticism** (3) Quitslun
Study of the phenomenon of religious experience and of selecte mystics in Judaism, Christianity, and Islam. (Fall)

127 **Medicine, Religion, and Healing** (1) Yeid
Total care concept. Importance of religion in medical practice for pa tient and physician. Concept of the professional, the clergy's role i healing, religious prespective on issues in medical ethics. (Spring

137 **The Land of Israel and the Growth of the Western Religions** (6) Staf

143 **Early Christianity and the Spiritual Life of the Ancient World** (3) Wallace
Rise and development of Christianity in relation to the culture philosophy, mystery religions, and general religious life of the Greco Roman world to A.D. 500.

144 **Medieval Faith and Symbolism** (3) Wallace
Christian life and thought in the Middle Ages; mystics, saints, popes and philosophers.

145 **Religious Currents in the Renaissance and Reformation** (3) Wallace
Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason (Fall)

146 **Christianity in the Modern World** (3) Wallace
Changes in Christian life and thought since 1700 as seen in theology literature, political life, and religious institutions. (Spring)

155 **Anthropological Approaches to Religion** (3) Simons, Wagner
An interdepartmental course offered by the Anthropology and Re ligion Departments. Theories of religion developed by anthro pologists; survey of world religions with emphasis on preliterate societies; religious processes and change. (Spring)

157 **Indian Philosophy and Mysticism** (3) Hiltebeitel

Indian speculative and mystical traditions: late *Vedas, Upanishads, Bhagavad Gita*, Buddhist, and Hindu soteriological systems.

158 **Ancient Indian Literature and Religion** (3) Hiltebeitel

Studies of foundational texts of Hinduism, especially *Rig Veda, Brahmanas, Mahabharata*, (including the *Bhagavad Gita*); attention to Hinduism's archaic and seminal themes.

159 **Mythologies of India** (3) Hiltebeitel

The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric); ties with Indian caste, cult, cosmology, and spiritual ideals. (Fall)

160 **Buddhism** (3) Hiltebeitel

Origin, development, and contemporary status of Buddhist life and thought; its impact on the Near East. (Spring)

161 **Islam** (3)

Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East. (Spring)

162 **Symbolism in the History of Religions** (3) Hiltebeitel

Religious symbolism, myth, legend, and ritual in the religions of the world: various theoretical analyses. (Spring)

172 **Religion in American Culture** (3) Wallace

Growth of religious bodies and institutions in relation to American culture, development of religious thought, and analysis of the contemporary religious scene. (Fall)

174 **American Judaism** (3) Altshuler

Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, diaspora, the Holocaust, family and community dynamics. (Spring)

181 **Women in Western Religion** (3) Quitslund

Historical, theological, and ethical investigation of the image and role of women in Judaism and Christianity: special consideration of the Biblical experience, the sexual qualifications for religious office, use of male-female images and languages, and contemporary issues. (Fall)

184 **The Thought of Martin Buber** (3) Jospe

Basic principles underlying the Life of Dialogue and application of those principles to all strata of life from interpersonal relationships to the religious realm.

191 **Senior Honors Thesis** (3) Staff

Required of and open only to undergraduate honors candidates in religion. (Fall and spring)

Third Group

209–10 **Seminar: Biblical Studies** (3–3) Jones

Main problems of Biblical literary, historical, and theological criticism. (Rel 209—fall)

213 **Seminar: Judaism in Late Antiquity** (3) Altshul
Selected topics. (Spring)

222 **Seminar: Ethics** (3) Yeid
Selected topics. (Spring)

235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslun
Important leaders and their ideas in selected developments sinc 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical. Empha sis on 20th century. (Fall)

237 **Seminar: Theological Analysis** (3) Quitslun
Historical and topical study of the development of important ideas i such areas as Christology, ecclesiology, and death.

238 **Seminar: Contemporary Judaism** (3) Altshul
Selected topics.

262 **Seminar: History of Eastern Religions** (3) Hiltebeit
Selected topics. (Fall)

271 **Seminar: American Religious History to 1830** (3) Wallac
Religious thought and life during the Colonial and early Nationa period.

273 **Seminar: American Religious History since 1830** (3) Wallac
Religious thought and life from the Civil War to the present. (Fal

291–92 **Readings and Research** (3–3) Staf
Investigation of special problems. (Academic year)

299–300 **Thesis Research** (3–3) Staf
(Fall and spring)

ROMANCE LANGUAGES AND LITERATURES

Professors J.W. Robb, G.E. Mazzeo *(Chairman)*, J.A. Frey, J.L. Métivier, Jr J.F. Burks
Associate Professors M.A.B. Coffland, P.G. Sáenz, G. Ludlow, S.R. Barnet
Assistant Professors G.P. Huvé, J.E. Hicks, I. Azar, J.M. Thibault, M. Cruz Sáenz

Bachelor of Arts with a field-of-study major in (1) French language an literature, (2) Spanish language and literature, (3) Spanish-American literatur or (4) any approved combination selected from two of the preceding fields—Th following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students shoul consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and th natural and mathematical sciences.)

2. Prerequisite courses—Fren 1–2, 3–4, 9–10, or equivalent; or Span 1–2, 3–4 9–10, or equivalent.

3. Required introductory literature courses—Fren 51–52 or 91–92, or Span 51 52 or 91–92.

4. Required for the major:

There is no specific program of required courses. The student, however, is expected to demonstrate a knowledge of his or her field in breadth and dept

by passing a comprehensive examination at the end of the senior year. A proseminar is required as follows: Fren 199–200 for French language and literature majors; Span 199–200 for Hispanic language and literature majors.

Minor in French or Hispanic languages and literatures—Required: 6 semester hours of French or Spanish 51–52 or 91–92; 12 additional hours selected from among French or Spanish courses numbered 9 and above.

Master of Arts in the fields of (1) French literature, (2) Spanish literature, (3) Spanish-American literature, or (4) an approved combination of Spanish and Spanish-American literatures—Prerequisite: the degree of Bachelor of Arts in the appropriate field from this University, or an equivalent degree.
Required: the general requirements, pages 91–99. The program of study consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours), or, with the approval of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis.

Doctor of Philosophy fields of study in Romance literatures—Required: the general requirements, pages 91–93, 99–101. There are four fields: French literature; Spanish literature; Spanish-American literature; and any approved combination of French, Spanish, or Spanish-American literature.

Bachelor of Arts in Education and Human Development with teaching fields in French and in Spanish—Prerequisite: the education curriculum, page 114.
Required: the French option or the Spanish option and the professional courses listed on pages 117–18.

Placement Examinations: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

Departmental prerequisite: Fren 3–4 or 6, or equivalent, is prerequisite to all courses in French, from Fren 9 and above, except for courses offered in English translation.

First Group

1–2 **First-year French** (3–3) Frey and Staff

A year course; credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 **Second-year French** (3–3) Thibault and Staff

A year course; credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2. Laboratory fee, $17.50 per semester. (Fall and spring)

6 **Second-year French** (6) Thibault and Staff

Lecture (3 hours), discussion (3 hours). Intensive course which

covers material of Fren 3–4. Prerequisite: Grade of *B* or better in Fren 2. Laboratory fee, $17.50. (Fall and spring)

9 **Contemporary French Conversation** (3) Huvé and Staff
Emphasis on self-expression in a controlled situation. Special attention to the acquisition and active use of a flexible vocabulary. Oral and written reports and exercises. Prerequisite: Fren 4 or equivalent. (Fall and spring)

10 **French in Written Context** (3) Huvé and Staff
Study of vocabulary and syntax. Discussion of texts, reports, compositions, and translations into French. Prerequisite: Fren 9 or equivalent. (Fall and spring)

49 **French for Graduate Students** (0) Burks and Staff
For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of French Literature** (3–3) Métivier
Readings in French literature from the Middle Ages to the present. Lectures, readings, and informal discussions. (Academic year)

60 **Contemporary French Civilization** (3) Ludlow
Study of contemporary France as seen through its cultural, political, economic and social life, its geography, language, population and character. Class lectures and discussion of texts supplemented by slides, films, tapes and records. Conducted in English. (Summer)

91–92 **Analyse de texte** (3–3) Thibault
Methodology and vocabulary of literary criticism; application of principles of *explication de texte* to selections from prose, drama, and poetry from the Renaissance to the present. (Academic year)

Second Group

103 **Oral French With Emphasis on Pronunciation** (3) Huvé
The sounds of French; elements of phonetics. Exercises in reading and conversation with attention to accent, rhythm, and intonation. Prerequisite: Fren 10. (Fall)

108 **Advanced French Grammar** (3) Thibault
Compositions, drills, dictations. Translations into French. Prerequisite: Fren 10. (Spring)

109 **Advanced French Conversation** (3) Huvé and Staff
Readings and discussions based on French culture and civilization. Oral and written reports. Prerequisite: Fren 10. (Fall and spring)

110 **Advanced Written French** (3) Huvé and Staff
Study of vocabulary and syntax with emphasis on stylistic devices. (Fall and spring)

119 **French Literature of the Middle Ages** (3) Cruz-Sáenz
Literary history and development of ideas. Readings in the epic, courtly lyric, satire, and drama. Analysis of texts and discussion of criticism. May be repeated for credit. (Fall)

120 **French Literature of the Renaissance** (3) Métivier
Prose writers of the Renaissance from Rabelais to Montaigne; poetry and poetic theory in the Renaissance from the *Grands Rhétoriqueurs* to the *Pléiade*. May be repeated for credit. (Spring)

121 **17th-Century Classical Theater** (3) Burks
(Spring)

122 **17th-Century Prose and Poetry** (3) Burks

123 **The 18th-Century Novel and Theater** (3) Ludlow
Study of the major French novelists and dramatists of the period. Emphasis on the works of Marivaux, Voltaire, Diderot, Rousseau, Laclos, Beaumarchais. (Fall)

124 **The 18th-Century Enlightenment** (3) Ludlow
The contribution of Montesquieu, Voltaire, Diderot, and Rousseau to European and American thought of the period.

125 **Topics in 19th-Century French Literature** (3) Frey
(Spring)

126 **Topics in 19th-Century French Poetry** (3) Thibault

127 **20th-Century French Literature I** (3) Coffland
Fiction, poetry, and drama from 1900 to 1930. Chronological examination of authors and movements. (Fall)

128 **20th-Century French Literature II** (3) Coffland
Fiction, poetry, and drama from 1930 to the present. Chronological examination of authors and movements.

130 **Correspondences between Art and Literature** (3) Thibault
Expression of common preoccupations in diverse media. Readings, slides, lectures, and informal discussions. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Summer)

133 **Seminar: French Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Spring)

151 **Cinema and Literature** (3) Thibault
Interaction between film and literature; aesthetic theories and their applications to film and literary genres. Selected films and readings. May be repeated for credit. (Summer)

199–200 **Proseminar: Readings for the Major** (3–3) Burks and Staff
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

202 **Thème et version** (3) Ludlow
Limited to graduate students; open to others only by permission of the instructor. Required of all graduate students in the field of French language and literature. Analysis and translation of selected prose passages, alternating between French and English; designed to teach students to write with precision and clarity.

213 **Medieval French Literature** (3) Cruz-Sáenz
Topic to be announced in the *Schedule of Classes*. Study of the origins and development of modern French from its Latin beginnings through Old and Middle periods. Some knowledge of Latin is desirable but not necessary. May be repeated for credit. (Fall)

214 **Seminar: Special Topics in Medieval French Literature** (3) Cruz-Sáenz
May be repeated for credit.

221 **Special Problems in 16th-Century French Literature** (3) Burke
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

229–30 **Literary Renaissance in Europe** (3–3) Burke
Study of the developments in the poetry of Italy, France, and England.

231–32 **Theater in the 17th Century** (3–3) Burke
Survey of the development of theatrical arts and the drama. Research papers and reports

234 **17th-Century Nondramatic Literature** (3) Ludlow
Study of the poetry, novel, and philosophical writings of the Baroque and Classical periods.

241 **The Age of Enlightenment in Europe** (3) Ludlow
The contribution of the *philosophes* to the intellectual evolution of France and Europe. Emphasis on the relations among French, English, and German thought. Readings in English and French. (Fall and spring)

242 **Seminar: the French Novel and Theater in the 18th Century** (3) Ludlow
Major 18th-century French novelists and dramatists and a comparison of their work with that of some English and German writers of the period. Readings in English and French.

244 **Special Problems in 18th-Century French Literature** (3) Ludlow
Topic to be announced in the *Schedule of Classes*. May be repeated for credit.

253 **Special Problems in 19th-Century French Literature** (3) Frey
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall)

258 **Special Problems in 19th-Century French Poetry** (3) Thibault
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Spring)

264 **Seminar: Modern Period** (3) Coffland
Narrative voices and new directions in the 20th-century novel. (Spring)

265 **20th-Century French Theater** (3) Coffland
Survey of the development of the theater from 1900 to the present

266 **20th-Century French Poetry** (3) — Coffland

Background and development of poetry in the 20th century; *explication de texte* approach.

295 **Independent Reading and Research in French Literature** (arr.) — Staff

For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) — Staff

(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the Department of Romance Languages and Literatures.

301–308 **Folger Institute Seminar** (3 each) — Staff

Topics will be announced.

398 **Advanced Reading and Research** (arr.) — Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ITALIAN

First Group

1–2 **First-year Italian** (3–3) — Coffland and Staff

A year course: credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Second-year Italian** (3–3) — Coffland and Staff

A year course: credit toward a degree at this University given on completion of Ital 4. Conversation, grammar review, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Prerequisite: Ital 1–2. Laboratory fee, $17.50 per semester. (Academic year)

9–10 **Italian Conversation and Composition** (3–3) — Coffland

Prerequisite: Ital 4 or equivalent and permission of instructor. (Academic year)

11 **Italian through Opera** (0) — Chambers

Conversational Italian presented through excerpts from operas and their libretti. Pronunciation and grammatical principles, vocabulary,

and conversation. Tuition will be charged at the rate of one credi hour. (Summer)

Third Group

295 **Independent Reading and Research in Italian Literature** (arr.)
For students preparing for the Master of Arts or Doctor of Philosc phy degree. May be repeated for credit. (Fall and spring)

PORTUGUESE

First Group

31–32 **Intensive Portuguese** (3–3) Robb
Prerequisite: knowledge of one other Romance language. (Aca demic year)

SPANISH

Departmental prerequisite: Span 3–4 or 6, or equivalent, is prerequisite to al courses in Spanish, from Span 9 and above, except for courses offered in English translation.

First Group

1–2 **First-year Spanish** (3–3) Hicks and Staff
A year course; credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation grammar, composition, readings. Oral practice in language laboratory Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 **Second-year Spanish** (3–3) Hicks and Staff
A year course; credit toward a degree at this University given on completion of Span 4. Conversation, grammar review, composition reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2. Laboratory fee, $17.50 per semester (Fall and spring)

6 **Second-year Spanish** (6) Hicks and Staff
Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Span 3–4. Prerequisite: grade of *B* or better in Span 2 Laboratory fee, $17.50. (Fall and spring)

9–10 **Spanish Conversation and Composition** (3–3) Azar and Staff
Conversation, composition, vocabulary, and syntax. Prerequisite: Span 4 or equivalent. (Fall and spring)

12 **Spanish Conversation and Composition (Intensive)** (6) Azar and Staff
Intensive, accelerated course which covers the material of Span 9–10. Laboratory fee, $25. (Academic year)

20 **Prensa y Cultura: Intensive Spanish Conversation** (3) Azar and Staff
Intensive conversation organized around specific contemporary

topics; illustrated by periodical material, films and interviews. (Summer)

49 **Spanish for Graduate Students** (0) — Hicks and Staff

For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours, plus University Center fee. (Fall and spring)

51–52 **Survey of Spanish Literature and Civilization** (3–3) — Barnett

Social, artistic, and cultural background of Spanish literature. Lectures, readings, recitations, and informal discussions. (Academic year)

91–92 **Explicación de Textos** (3–3) — Sáenz

Analytical introduction to Spanish and Spanish-American literature. Method demonstrated and practiced on selected passages. (Academic year)

Second Group

109–10 **Advanced Spanish Conversation and Composition** (3–3) — Mazzeo and Staff

Development of writing and speaking skills. Emphasis on diction and style. Prerequisite: Span 10 or equivalent. (Academic year)

119–20 **Medieval Spanish Literature** (3–3) — Cruz-Sáenz

Survey by genre of the literature of the Middle Ages. (Academic year)

121–22 **Spanish Literature of the Golden Age** (3–3) — Azar

Span 121: poetry and drama; Span 122: prose.

123–24 **Cervantes: Don Quijote** (3–3) — Azar

The *Quijote* and the novel as a literary genre: reality and fiction. (Academic year)

125–26 **Modern Spanish Literature** (3–3) — Mazzeo

Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral readings, lectures on literature and history. (Academic year)

127–28 **Contemporary Spanish Literature** (3–3) — Sáenz

Prose, poetry, and drama of the 20th century. Class analysis of texts, collateral readings, lectures on literature and history.

130 **The Modern Spanish Essay** (3) — Mazzeo

Development of the Spanish essay from the 16th through the 20th centuries; emphasis on the 18th and 19th centuries. Class analysis of texts, collateral readings, and lectures. (Summer)

133 **Feminist Authors in Hispanic Literature** (3) — Mazzeo

Development of feminist themes in Hispanic literature. Class analysis of representative works with readings in Spanish or in English translation. (Summer)

137 **The Spanish Civil War and the Creative Artist** (3) — Barnett

Historical and literary study of the Spanish Civil War and the subse-

quent artistic reaction in Spain, Great Britain, France and the U. S
Taught in English with readings in Spanish or English. (Summer

141 **New Spanish-American Narrative** (3) Robb
Short stories of Borges, Cortázar, Fuentes, Arreola, Carpentier, Gar
cía Márquez. (Summer)

143 **Latin America: A Literary-Cultural View** (3) Robb
Contemporary Latin America: its culture and society as seen through
its writers. (Summer)

151–52 **The Spanish-American Novel** (3–3) Robb
Development of the novel in Spanish America. Lectures, collateral
readings, and class analysis of texts. (Academic year)

155–56 **Spanish-American Literature to 1880** (3–3) Robb
Literature of Spanish America from the colonial period to the latter
part of the 19th century. Lectures, collateral readings, reports, and
class analysis of important works.

157–58 **Spanish-American Literature since 1880** (3–3) Robb
Literature of Spanish America from 1880 to the contemporary period
Lectures, collateral readings, reports, and class analysis of importan
works.

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** (3–3) Barnett
Required of all majors. Conferences and group discussions. (Aca
demic year)

Third Group

215 **Seminar: Medieval Literature** (3) Cruz-Sáenz
221 **Seminar: Cervantes' "Don Quijote"** (3) Azar
Cervantes' literary theories, the *Quijote* and its relations with the
other *novelas cervantinas* as different modes of representing reality
in literary fiction. (Fall)

224 **Seminar: "La Celestina"** (3) Aza
(Spring)

225 **Seminar: Special Problems in Golden-Age Literature** (3) Aza
Topic to be announced in the *Schedule of Classes*. May be repeate
for credit.

231 **Seminar: 18th-Century Spanish Writers** (3) Mazzeo
Lectures and analysis of principal authors and works; relationship
with subsequent literary movements.

242 **Seminar: Spanish Romanticism** (3) Mazzeo
Lectures and analysis of principal authors and works. Collatera
readings. Problems of origins and development.

244 **Seminar: Naturalism and the Spanish Novel** (3) Mazzeo
Development of Naturalism in 19th-century Spain. Analysis of repre
sentative works of Pardo Bazán, Clarín, Blasco-Ibáñez and others
(Fall)

246 **Seminar: Works of Galdós** (3) Barnett
Ideological and stylistic analysis: relationship of Galdós' works to literary movements of the second half of the 19th century. (Spring)

248 **Seminar: Spanish Lyric Poetry of the 20th Century** (3) Sáenz
Stylistic analysis of the most significant poets from 1898 to the present. (Spring)

250 **Seminar: Novecentismo y Literatura de Entreguerras** (3) Sáenz
The prose writers: intellectualism and new forms of expression.

251 **Seminar: Works of Unamuno and Ortega y Gasset** (3) Sáenz
Study of the thought of Unamuno and Ortega y Gasset: analysis and commentary on the texts.

252 **Spanish Literature since the Civil War** (3) Sáenz
Development of the Spanish novel since 1939. (Fall)

253 **Seminar: Studies in Modern Spanish-American Poetry** (3) Robb
Poetic trends studied in selected poets and groups of poets from the Modernists through Post-modernists and Vanguardists to the present. (Fall)

255 **Seminar: Studies in 20th-Century Spanish-American Theater** (3) Robb
Trends in modern theater with emphasis on Mexico, Central America, Puerto Rico, Chile, and the Río de la Plata area. (Spring)

256 **Seminar: Studies in Mexican Narrative Prose** (3) Robb
Study of the emergence and development of the "New Mexican Narrative" through the works of Yáñez, Rulfo, Arreola, Fuentes, Leñero, and others.

261 **Seminar: Studies in the Spanish-American Short Story and Essay** (3) Robb
The Spanish-American short story and essay as artistic forms; selected modern short story writers and essayists.

264 **Seminar: Studies in Recent Spanish-American Fiction** (3) Robb
The "New Spanish-American Narrative" studied in the novels and short stories of Borges, Bioy Casares, Cortázar, Vargas Llosa, García Márquez, Carpentier, Cabrera Infante, and others.

266 **Seminar: Alfonso Reyes: Essayist, Poet, Narrator** (3) Robb
Alfonso Reyes—essayist, poet, narrator and complete literary humanist—studied in his various prose and poetic works.

287 **Seminar: Problems in Latin-American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of the chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

295 **Independent Reading and Research in Spanish and Spanish-American Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staf
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staf
Limited to students preparing for the Doctor of Philosophy genera examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staf
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SANSKRIT

See **Germanic Languages and Literatures.**

SERBO-CROATIAN

See **Slavic Languages and Literatures.**

SERVICE-LEARNING PROGRAM*

Associate Professor S. Greene
Adjunct Associate Professor L.J. Lear *(Coordinator)*
Assistant Professors H. Nashman, N.C. Garner, D.J. Lynn
Adjunct Instructor P.E. Wallace, Jr.

151 **Urban Legal Services** (6) Wallace
Field work (16–20 hours per week) and academic study of the urban legal system. Role of urban legal system in promoting humanistic values and enhancing social change. Admission by permission of instructor. (Fall and spring)

152 **Issues in Education and Human Services** (6) Nashman
Exploration of the effects of education on society and vice versa opportunities for experience, study, and service (16–20 hours per week) in public, private, museum, hospital, and community education centers. Admission by permission of instructor. (Fall and spring)

153 **Issues in American Health Care** (6) Lynn
Field work combined with academic study of present American health care system and its problems: cost, quality of care, delivery of health care, ethical issues, health education, consumer issues, etc. Field placements (16–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

154 **Independent Study** (3 or 6) Lear
Field work combined with academic study, involving field-place

* Administered by the Division of Experimental Programs.

ments and complementary academic program of study, under the supervision of an appropriate faculty member. Students must "contract" with the agency, the faculty member, and the Service-Learning Program. Admission by permission of instructor. (Fall and spring)

155 **Issues in Managing the Arts** (6) Garner

Studies in the purpose and operation of the arts organizations in Washington. Weekly seminars and placement in an internship in an arts organization (16–20 hours per week). Discussion topics focus on the process of communication between artists and the public, the government, and the business community. Open to students with a demonstrated interest in the arts and the maturity to perform in a responsible position in an arts organization. (Fall and spring)

156 **Community Planning and Development** (6) Greene

Field work combined with academic study of the role of urban and regional planning in analyzing and responding to the needs of an urban society. Field placements (16–20 hours per week) in a public agency or in the private sector. Admission by permission of instructor. (Fall and spring)

157 **Social Issues in Engineering** (3) Staff

Provides the opportunity to explore social policy and value issues within the engineering profession. Students must enroll concurrently in EngS 206. Seminars will focus on energy and field placements (16–20 hours per week) will be in energy-related offices. Admission by permission of instructor. (Fall and spring)

158 **Society and Aging** (6) Staff

Exploration of the challenges posed by the rise in the median age of our population and the significant increase in the number of older Americans. Field work combined with academic study of the impact of these changes on political and economic institutions and on cultural values. Admission by permission of instructor. (Fall and spring)

SINO-SOVIET STUDIES

See **Institute for Sino-Soviet Studies.**

SLAVIC LANGUAGES AND LITERATURES

Professors H.B. Yakobson, C.A. Moser *(Chairman)*, N.N. Natov
Associate Professors G.A. Olkhovsky, W.W. Rowe, I. Thompson
Assistant Professor M.F. Miller
Assistant Professorial Lecturer S. Ficks

Bachelor of Arts with a major in Russian language and literature (field-of-study or departmental)— The following requirements must be fulfilled.

1. The general requirements as stated on pages 74, 81–87.
2. Prerequisite courses: Slav 5–6 (preferred), or Slav 1–2, 3–4; or equivalent; and Slav 91–92.
3. Required for the major:

Field-of-study major—By the end of the senior year the student will be

expected to have a reasonable command of language skills and a grasp of th fundamentals of Russian structure, as well as a good foundation in Russia literature and culture. The passing of a major examination during the senio year is required. The department provides a proseminar to assist the studen in preparation for the major examination.

Departmental major—from 30 to 36 semester hours of course work in th Department of Slavic Languages and Literatures distributed as follows: Lan guage—12 to 15 hours chosen from Slav 9–10, 101, 103, 104, 109–10, 125; Cultur and Civilization—six hours chosen from Slav 161–62, 172; Literature i Russian—six hours chosen from Slav 141–42, 151–52; Literature in Englis Translation—six to nine hours chosen from second-group courses.

A student who is already proficient in Russian language or literature ma upon passing an appropriate examination, waive any or all of the first-grou language or literature courses, as well as up to six semester hours of second group courses.

Bachelor of Arts with a major in Russian literature and culture—in trans lation (field-of-study)—The following requirements must be fulfilled.

1. The general requirements as stated on pages 74, 81–87.

2. Prerequisite courses—Slav 47 and 49, or Slav 1–2 and 3–4, or equivalen and Slav 91–92.

3. By the end of the senior year the student will be expected to have a goo grasp of Russian literature and the principles of literary criticism, as well as general knowledge of Russian culture and history. The passing of a majo examination during the senior year is required. The department provides proseminar to assist the student in preparation for the major examination.

A student who is already proficient in Russian language or literature ma upon passing an appropriate examination, waive any or all of the first-grou language or literature courses, as well as up to six semester hours of second group courses.

Master of Arts in the field of Russian language and literature—Two area of concentration are offered: Russian language and literature, and Russia language and linguistics.

Prerequisite: the degree of Bachelor of Arts with a major in Russian languag and literature or Russian literature and culture—in translation from this Un versity, or an equivalent degree. A student planning a concentration in Russia language and literature must have a general proficiency in the Russian la guage, a general knowledge of Russian literature and an acquaintance wit Russian history and culture. A student planning a concentration in Russia language and linguistics must have a general proficiency in the Russian la guage, a general knowledge of its structure, and an acquaintance with genera linguistics.

Required: the general requirements, pages 91–99. The program of study consists of 24 semester hours of approved course work plus a thesis (equiva lent to six semester hours) or 30 semester hours of approved course wor without a thesis. Candidates electing the Russian language and literatur concentration must include six semester hours of linguistics and at least 1 hours of literature; candidates electing the Russian language and linguistic concentration must include six semester hours of literature and at least hours of language and linguistics. All candidates must pass a reading know edge examination in either French or German and must pass a Master' Comprehensive Examination.

Bachelor of Arts in Education and Human Development with a teaching fie in Russian—Prerequisite, the education curriculum, page 114.

Required: the Russian option and the professional courses listed on page 11

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

First Group

1–2 First-year Russian (3–3) — Yakobson and Staff

Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 Second-year Russian (3–3) — Yakobson and Staff

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1 2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 Intensive Beginning Russian (6–6) — Thompson and Staff

Classroom (7 hours), laboratory (1 hour). Beginners' intensive course in the fundamentals of Russian. Prerequisite to Slav 6: Slav 2 or 5. Laboratory fee, $17.50 per semester. (Academic year)

9–10 Intermediate Russian Conversation and Composition (3–3) — Yakobson

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor. (Academic year)

31–32 Elementary Polish (3–3) — Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

41–42 Elementary Serbo-Croatian (3–3) — Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 42: Slav 41 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

47 Beginning Russian for Reading (3) — Moser

For undergraduate and graduate students with little or no Russian who wish to acquire a reading knowledge of the language. No academic credit for graduate students. (Fall)

49 Russian Reading (3) — Moser

Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Spring)

51–52 Elementary Bulgarian (3–3) — Moser

Beginners' course in fundamentals of grammar and pronunciation. Prerequisite to Slav 52: Slav 51 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

71 Introduction to Russian Civilization (3) — Olkhovsky

Survey of Russia's artistic, social, and cultural development. Lectures, discussion, visual aids—in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) Mose
Emergence and development of Russian literature and ideas durin the 19th and early 20th centuries—in English. (Academic year)

Second Group

101 **Readings in the Soviet Press** (3) Fick
Representative reading and translation of Soviet periodicals an current publications in social sciences. Prerequisite: Slav 4, 6, 49, o permission of instructor. (Fall)

103 **Scientific Russian** (3) Fick
Representative readings in the major fields of Russian contemporar scientific literature. Prerequisite: Slav 4, 6, 49, or permission of in structor (Spring, even years)

104 **Business Russian** (3) Fick
Study of Russian business vocabulary and concepts of business i the Soviet context. Prerequisite: Slav 4, 6, 49, or permission of in structor. (Spring, odd years)

109–10 **Advanced Russian Conversation and Composition** (3–3) Yakobso
Developing proficiency in oral and written expression. Prerequisite Slav 10 or equivalent. (Academic year)

125 **Special Problems in Russian Grammar** (3) Thompso
(Formerly Slav 195)
Study of selected areas of Russian grammar: emphasis on the practical use. Prerequisite: two years of Russian or permission o instructor.

128 **Dostoevsky: The Man and the Artist** (3) Nato
Sources and development of Dostoevsky's philosophical, religiou and aesthetic ideas. His influence on Russian and Western literature Lectures, discussions, and reports—in English. (Fall)

141–42 **19th-Century Russian Literature** (3–3) Sta
Readings of representative texts: poetry, prose, drama—in Russia Prerequisite: Slav 4 or 6, or equivalent. (Academic year 1980–8

143–44 **The Russian Novel** (3–3) Mose
Study of representative novels of the 19th and 20th centuries English. (Academic year 1980–81 and alternate years)

146 **The Russian Short Story** (3) Nato
Historical development of the Russian short story. Lectures, report and class analysis—in Russian. (Spring, odd years)

151–52 **20th-Century Russian Literature** (3–3) Nat
Readings of representative texts: poetry, prose, drama—in Russia Prerequisite: Slav 4 or 6, or equivalent. (Academic year 1981–8

156 **Leo Tolstoy: His Life and Works** (3) Row
Evolution of Tolstoy's artistic and philosophical ideas. Tolsto impact on Russian literature and society. Lectures, reports, and class room analysis of his major works—in English. (Spring)

157 **Nabokov** (3) Rowe

Reading and discussion of the major creative works. Russian roots, ordering of reality, sexual symbolism—in English. (Fall)

161–62 **Russian Culture** (3–3) Olkhovsky

Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports. (Academic year)

165 **Soviet Literature from the Revolution to World War II** (3) Natov

Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English. (Fall)

166 **Soviet Literature from World War II to the Present** (3) Natov

Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s and 1970s. Lectures, discussions, reports—in English. (Spring)

172 **Soviet Dissent** (3) Olkhovsky

Examination of artistic and intellectual dissent since the death of Stalin: underground press, songs, plastic arts—in English. (Spring)

178 **Women in Russian Literature** (3) Staff

The unique role of women in Russian literature. Reading and discussion of major works by Russian women writers in English. (Spring, even years)

191 **Russian Literature to 1800** (3) Moser

Survey of Russian literature from the earliest times to the end of the 18th century—in English.

199–200 **Proseminar: Readings for the Major** (3–3) Staff

Conferences and group discussions. (Academic year)

Third Group

211 **Russian Phonology** (3) Thompson

Linguistic analysis of the phonology of standard contemporary Russian. (Fall)

212 **Russian Morphology** (3) Thompson

Linguistic analysis of the morphology of standard contemporary Russian. (Spring)

213 **Russian Syntax** (3) Thompson

Linguistic analysis of the syntax and semantics of standard contemporary Russian. (Fall)

214 **Methodology of Teaching Russian** (3) Thompson

Survey of modern methods, techniques, and materials for teaching Russian as a foreign language. Examination of textbooks, classroom observation, practice teaching. Prerequisite: 18 semester hours of Russian language. (Spring)

215 **Russian Historical Grammar** (3) Moser

An analysis of the historical development of Russian phonology, morphology, and syntax. (Fall, odd years)

218 **History of the Russian Literary Language** (3) Mose
The development of the norms of the Russian literary language from earliest times to the present. (Spring, even years)

220 **Russian Stylistics** (3) Natov
Analysis of various styles of contemporary Russian from the point of view of structure and lexicon. (Spring, odd years)

225 **Pushkin and the Poets of his Time** (3) Natov
Pushkin's predecessors; Pushkin's poetry and drama. Lermontov—the heir to Pushkin's poetic tradition. (Fall, odd years)

253 **Seminar: Literary Criticism** (3) Natov
Study of leading Russian critics and their role in the development of Russian literature; the emergence of various literary schools. (Spring, even years)

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3) Mose
Discussion of literary and intellectual developments in the Russia of the 1860s. Reading knowledge of Russian required. (Spring, odd years)

255 **Seminar: Main Trends in 20th-Century Russian Literature** (3) Natov
Study of representative works since 1900; their artistic and social value—in Russian. (Fall, even years)

295 **Independent Reading and Research** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

SOCIOLOGY

Professors R.W. Stephens, I.H. Cisin, R.G. Brown, T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace
Associate Professors J. Helmer, P.L. Stewart *(Chairman)*, J.L. Tropea
Adjunct Associate Professor G. Wisan

Bachelor of Arts with a major in sociology (departmental)—Three categories of majors are offered: (a) general major; (b) special concentration in crime, deviance, and justice; (c) special concentration in public policy. Options (b) and (c) require departmental approval. The following requirements must be met by all majors except when stated otherwise:

1. The general requirements as stated on pages 74, 81–87. (Students must consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economics, geography, history, political science, or psychology.
4. Required courses in the major—Soc 101, 140–41, 149; general majors: 15 additional semester hours in second-group sociology courses; crime, deviance

and justice: Soc 135, 136, 137, 139, and one additional second-level sociology course; public policy: Soc 120, 122, 126, 181, and one additional second-level course in sociology.

Minor in Sociology—A minimum of 15 hours of course work, including Soc 1, a basic course in either theory or methods, and nine hours of electives in courses at the 100 level or higher are required. There are two categories of minor: (a) a general minor; (b) a special concentration in one of the areas of concentration offered by the department, such as public policy or crime, deviance, and justice. Option (b) requires departmental approval. All students wishing to minor in sociology must seek departmental advising.

Master of Arts in the field of sociology—Prerequisite: a bachelor's degree with a major in sociology or in an approved related field. Applicants should present scores on the Graduate Record Examination, especially in the Verbal and the Quantitative Tests, and arrange for former professors to write letters of reference to the Graduate School of Arts and Sciences.

Required: the general requirements, pages 91–99. With the approval of the advisor and of the Graduate Education Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to six semester hours), satisfactory completion of a Master's Comprehensive Examination in sociological theory and social research methods and an oral defense of the thesis proposal; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in sociological theory, social research methods, and one substantive special field (deviant behavior, political sociology, sociology of work, comparative social change, and sociology and social policy). Fifteen semester hours of elective courses must be interrelated in a logical way to form a subspecialization; 9 hours may be taken outside of the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. Students majoring in social policy need an additional statistics course; Stat 118 or 221 is suggested. All candidates must select from the graduate sociology courses as follows: six hours chosen from sociological theory (Soc 238 and 239 are recommended), six hours chosen from social research methods (Soc 230 and 231 are recommended), and six hours chosen from one special area (deviant behavior, political sociology, sociology of work, comparative social change, or sociology and social policy). Candidates must also fulfill the tool requirement by passing a reading knowledge examination in one foreign language, by satisfactorily completing the quantitative tool option, or by satisfactorily completing the graduate course work option.

Doctor of Philosophy in the field of sociology—Required: the general requirements, pages 91–93 and 99–101. Students must complete from 30 to 36 semester hours of graduate course work, and from 12 to 18 semester hours of dissertation research, for a total of 48 hours beyond the master's degree. Students must include in their program of study Soc 332 and 6 semester hours of graduate course work in each of the following: sociological theory, social research methods, and two substantive specialties, at least one of which must be chosen from among those offered by the Department of Sociology—deviant behavior, political sociology, sociology of work, sociology and social policy, and comparative social change. Students must satisfactorily complete the General Examination in sociological theory, social research methods, and two substantive specialties. Students must also fulfill the tool requirement by taking any two of the following options: a reading knowledge examination in one foreign language, the quantitative tool option, or the graduate course work option.

Departmental prerequisite: Soc 1 is prerequisite to all courses in Sociology except for Soc 181 and 191.

First Group

1 Introductory Sociology (3) Staff
General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior. (Fall and spring)

2 Major Social Issues (3) Staff
Critical examination of selected social issues in contemporary American society. (Fall and spring)

Second Group

101 Development of Social Thought (3) Lengermann, Stephens
An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories. (Fall)

120 Sociology and Public Policy (3) Staff
Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy. (Fall)

122 Cases in Policy Analysis (3) Staff
Sociological analysis of topical issues in public policy (e.g., education, health, energy, welfare). (Spring)

124 Medical Sociology (3) Stewart, Brown
Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions; medical organizations, problems of delivery of health care services. (Fall)

125 Sociology of Religion (3) Wallace, Yeide
An analysis of the relationships between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years)

126 Urban Sociology (3) Staff
The sociological dynamics of the city and of urban growth in the United States: urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition, and revolt. (Fall)

127 Population Problems (3) Stewart
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control. (Fall)

128 Comparative Urban Sociology (3) Staff
Processes of urbanization outside the United States; contrasts between socialist and non-socialist approaches to urban development; urban communities in the Third World and their problems. Prerequisite: Soc 126 or permission of the instructor. (Spring)

129 Race and Minority Groups (3) Staff

Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice. (Spring)

130 Class, Status, and Power (3) Stephens

Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions. (Fall)

133 Sociology of Education (3) Wallace, Tropea

Analysis of educational systems from institutional perspectives and as agencies of socialization; relationships of education in general to society, including technological, communal, and subcultural components. (Spring)

135 Youth and Delinquency (3) Courtless, Tropea

Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control. (Spring)

136 Criminology (3) Courtless, Tropea

Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society. (Fall)

137 Sociology of Law (3) Courtless, Tropea

Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law. (Fall)

139 Deviance and Control (3) Tropea, Courtless

Analysis of the development of primary deviance through processes of socialization; analysis of the creation of secondary deviance through collective definitions and responses, within varying historical, political, and social contexts. (Spring)

140–41 Social Research Methods (3–3) Cisin

Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140. (Academic year)

143 Social Movements (3) Stephens

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions. (Spring)

149 Modern Sociological Theory (3) Wallace, Lengermann

Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101. (Spring)

151 Problems of Urban Social Systems (9) Staff

Developing a comprehensive perspective on selected social problems through lectures and readings. Topic changes each semester. Prerequisite: 24 semester hours selected from economics, history, poli-

tical science, psychology, and sociology. Admission by permissio of instructor. Concurrent registration in Soc 152 required. (Fal and spring)

152 **Problems of Urban Social Systems—Supervised Field Work** (6) Staf

Accompanies Soc 151. A maximum of 24 hours a week will be spen in service-research efforts by placement in the Washington, D.C. area. Concurrent registration in Soc 151 required. (Fall and spring

153 **Poverty in America** (3) Staf

Interdepartmental course offered by the Departments of Sociology and Economics. Exploration of social and economic causes o poverty in the United States and evaluation of anti-poverty strategies including comprehensive welfare reform. Discussion of conflicts be tween sociological and economic models of behavior of low-income groups.

155 **Women, Sex Roles, and Socialization** (3) Wallace

Analysis of the social-structural and personality theories and em pirical research on sex role socialization in contemporary society Topics include sexual inequality, women's changing place in the occupational structure, and social change and the women's move ment. (Fall)

160 **Death and Dying: A Sociological Perspective** (3) Staf

Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care abortion, murder, funeral customs, genocide, and the depiction o death in literature and philosophy. (Spring)

181 **Major Social Processes** (3) Staff

Analysis and examination of various processes in society of genera importance to the field of sociology, e.g., social conflict, socialization social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. A laboratory fee o $5 may be charged. (Fall and spring)

191 **Current Emphases in Sociology** (3) Staff

Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated fo credit. Admission by permission of instructor. (Fall and spring

195 **Research** (1, 2, or 3) Staff

Independent study and special projects. Open only to selected under graduate students with promising academic records. Before students are permitted to register for Soc 195, they must submit a written pro posal of their plan of study for the approval of the staff member o the department who will be directing their research. (Fall an spring)

Third Group

203 **Social Organization** (3) Wallace, Brow

Introduction to sociological concepts and perspectives on society as a system of institutions. Recommended for students offering soci ology as a supporting field. (Fall)

210 Theoretical Foundations of Political Sociology (3) Lengermann
Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change. (Fall)

220 Religious Institutions in Urban America (3) Wallace, Yeide
Structural variety of religious institutions and patterns of interaction between religious and secular institutions in contemporary urban life. (Spring, even years)

225 Theories of Social Change (3) Lengermann
Review of sociological writings on modernity—its emergence in the North Atlantic societies, its consequences for third world societies, and its future. Consideration of the methods of historical sociology and comparative sociology. (Spring)

226 Comparative Social Development (3) Staff
Analysis of major issues in the sociology of development, urbanization, and modernization. Among the issues to be considered are political development, education, sex roles, urban growth, family welfare and change, and public administration. (Fall)

230 Sociological Research Methods (3) Cisin
Systematic survey of sociological research strategies and review of the literature in this area. Recommended for students with only one undergraduate course in research techniques. Prerequisite: Soc 141 or equivalent. (Fall)

231 Seminar: Advanced Research Methods (3) Cisin
Intensive study and evaluation of a few sophisticated research techniques and of new developments in the methodology of social research. Prerequisite, Soc 230 or equivalent. (Spring)

232 Seminar: Research Planning and Execution (3) Cisin
Clinical review of student research projects; recommended for students engaged in thesis and dissertation research. Prerequisite: Soc 230 or equivalent. (Spring)

235 Seminar: Sociology of Education (3) Wallace
Sociological theories on relationships between education and the economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 Seminar: Development of Sociological Theory (3) Lengermann
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 Seminar: Modern Sociological Theory (3) Lengermann, Wallace
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 Sociology of Work and Occupations (3) Stewart
Review of major theoretical and empirical developments in industrial sociology, varying approaches to the study of work and occupations. (Fall)

241 **Sociology of Work and Organizations** (3) Stew
Theory of complex organizations relative to work in industry, gove ment, and business: examination of basic processes such as decisi making, recruitment, allocation of authority, informal organizati and interorganizational relations. (Spring)

242 **Seminar: Medical Sociology** (3) Stew
Sociological analysis of cultural, social, and social-psychologi factors in occurrence and care of physical and mental illness they function in the community, the hospital, and in interperso relations; study of the social structure of health care services a interplay of the various health professions. (Spring)

252 **Seminar: Sociology and Social Policy** (3) St
Concepts, theory and research which demonstrate the applicabili of a sociological perspective (for example, views on social syste roles, formal organization, power, stratification, decision-maki social values) to the policy process. (Fall)

254 **Seminar: Methods in Social Policy Research** (3) St
Offered jointly by the Educational Policy and Sociology Departmen Systematic survey of conceptualization, design, and practice of eva ation research of social experiments, and of simulation and techn logical forecasting. Prerequisite: Stat 105, Soc 230, 252; or permissi of instructor. (Spring)

256 **Selected Topics in Social Policy Analysis** (3) St
A sociological perspective on selected policy areas, including urb planning, education, family, aging, health, affirmative action, law e forcement, and economic development. Particular policy areas w be rotated year by year. Course may be repeated for credit.

*259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Courtless, Trop
Same as Law 475(2). (Fall)

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Courtless, Trop
Same as Law 476(2). (Spring)

262 **Seminar: Police and the Community** (3) Courtless, Trop
Analysis of contemporary urban law enforcement, including policin "styles," civil disorder, police-community relations, and competi perspectives on the place of police agencies in civil societ (Fall)

263 **Seminar: Law and Society** (3) Courtles
Selected problems in law as an instrument of social policy; emphas on the organization of legal decision-making processes. (Summe

265 **Selected Topics in Criminal and Juvenile Justice Policy** (3) Courtless, Trop
Development of a systematic perspective on policies affecting th juvenile and criminal justice systems. Topics will include adjudic tion, disposition, diversion, and sentencing. (Spring, even years)

* Students registering for Soc 259 or 261 make special arrangements with the instructor f supplementary assignments equivalent to one additional semester hour. For description of t courses, see the *National Law Center Bulletin*

280 **The Sociology of Aging** (3) Brown

Impact of current demographic changes (size and composition of the aged population) on the existing structure of American society. (Spring)

281 **Problems of Growing Old in American Society** (3) Brown

Analysis of the bases of the social status of the aged in American society, the impact on older people of characteristic situational changes in later life, and societal responses to those impact areas defined as social problems.

290 **Principles of Demography** (3) Staff

An interdepartmental course offered by the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) Staff

An interdepartmental course offered by the Departments of Economics, Geography and Regional Science, Sociology, and Statistics. Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Research** (arr.) Staff

Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

332 **Seminar: Processes in Inquiry** (3) Staff

Development and critical review of students' research projects with the objectives of aiding conceptualization and developing research design. Consideration of the interplay between theory and methods. Prerequisite: at least three semester hours each of graduate theory and graduate methods. May be repeated for credit.

351 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as the demand requires each fall semester: (1) *Social Research*—causal inference in social research, evaluation research, philosophy of science, etc.; (2) *Political Sociology*—comparative political structures, processes of policy formation, social movements, etc.; (3) *Sociology of Work*—work and public bureaucracies, industrial sociology, etc.

352 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as the de-

mand requires each spring semester: (1) *Sociological Theory*—stu
of important theorists such as Marx, Weber, Parsons; importa
themes such as social change, social control; important schools su
as symbolic interactionism, general systems theory; (2) *Law and S*
ciety—the sociology of law, theories of deviance, and related topi

398 **Advanced Reading and Research** (arr.) St
Limited to students preparing for the Doctor of Philosophy gene
examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) St
Limited to Doctor of Philosophy candidates. May be repeated f
credit. (Fall and spring)

SPANISH

See **Romance Languages and Literatures.**

SPECIAL EDUCATION

Professors P. Botwin, R.S. Cottrell, Jr., R.K. Ives *(Chairman)*
Associate Professors J.R. Shotel, M.S. Castleberry
Assistant Professors, L.A. Tsantis, N.D. Tiscione, N.J. Sobel, R. Ianacon
A.J. Mazur *(Research)*
Assistant Professorial Lecturer H. Novakovitch
Instructor M.B. Freund *(Research)*
Lecturers W.H. Eddy, J. Snider

Programs of study in special education leading to the degrees of Bachelor o
Arts in Education and Human Development, Master of Arts in Education an
Human Development, and Doctor of Education are offered by the School o
Education and Human Development (see pages 103–34).

Second Group

101 **Seminar: Dimensions of the Complementary Teaching Role** (3) Mazu
Instructional experiences designed to refine the insights and compe
tencies essential for successful operation of the complementar
teaching model. (Fall)

102 **Teaching the Child with Special Needs: Methods and Materials** (3) Mazu
Laboratory course taught in an elementary public school. Studen
observe and participate in a demonstration seminar conducted b
the instructor. Must be taken concurrently with SpEd 189. (Fall

103 **Teaching the Child with Special Needs: Creative Programming** (3) Mazu
Continuation of SpEd 102. Concentration on the total programmin
of the child with special needs. Must be taken concurrently wi
SpEd 190. (Spring)

160 **Academic and Psychosocial Assessment of the Elementary-School-Aged Exceptional Child** (3) — Staff

An investigation of the assessment process: theory and scope of psycho-educational assessment, informal and formal assessment, clinical experience in informal assessment, application of diagnostic findings to instructional recommendations.

168 **Overview of Handicapping Conditions: Etiology and Symptomatology** (3) — Staff

Causes and symptoms of most prevalent handicapping conditions in the mainstreamable child.

170 **Interpersonal/Intrapersonal Relationships for Special Education Teachers** (3) — Mazur

Consideration of factors leading to successful interaction with children. (Fall)

187 **Introduction to Sign Language and Deafness** (3) — Staff

Basic expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 187 and HKLS 187.

188 **Sign Language and Deafness** (3) — Staff

A second course in conversational expressive and receptive skills in sign language of the deaf. Discussion of issues and implications of deafness. Same as Educ 188 and HKLS 188.

189 **Preprofessional Practicum: Observing the Special Child in the Regular Class Milieu** (3) — Staff

Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Preprofessional Practicum: Inspecting a Continuum of Special Education Services** (3) — Staff

Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with SpEd 103. (Spring)

197–98 **Special Study in Special Education** (3–3) — Staff

Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

199 **Practicum in Complementary Teaching** (6) — Mazur

Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Spring)

200 **Psychosocial Development of Young Exceptional Children** (3) — Tiscione

The relationship between psychosocial development of the exceptional child and psychosocial development in general. Admission by permission of instructor. (Fall, alternate years)

Third Group

201 Introduction to Special Education (3) Botw
Survey course to acquaint prospective teachers with special educ tion and to help them become aware of the various education modifications necessary to accomodate children in a school progra (Fall)

230 Vocational/Special Education Assessment of the Secondary Level Handicapped Student (6) Ianacon
Individual study of methods and materials used in vocational assess ment including formal and informal tests to determine vocationa interests and aptitudes, academic performance, learning style an behavioral readiness. (Fall)

231 Selected Vocational/Special Education Methods and Materials (3) Staf
Selected materials and techniques used in teaching and programmin for the secondary school level handicapped person in academic career, leisure, and occupational skill areas. (Fall)

232 Practicum: Vocational/Special Education (3) Ianacon
Placement in at least three to five different sites offering programs in the areas of pre-vocational, industrial arts, and vocational pro gramming that serve the adolescent student. (Fall)

233 Curriculum for Vocational/Special Education (3) Staf
Examples and practice in designing and implementing academic, self- help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped. (Fall)

234 Seminar in Vocational/Special Education (3) Staff
Weekly seminar dealing with experiences, problems, and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with SpEd 295. (Spring)

235 Coordination of Job Placement Programs in Vocational/Special Education (3) Staff
Examples and programming considerations for the development and coordination of an adolescent job placement program. (Spring)

236 Secondary Career Planning for the Handicapped (3) Eddy
Legislative issues and the on-going process of career decision mak- ing by the handicapped person who is completing a secondary school level program. (Summer)

260 Developmental Assessment of Young Exceptional Children (3) Shotel, Tsantis Tiscione, Sobe
Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor (Fall)

261 Practicum: Methods and Materials for Young Exceptional Children (6) Ives, Tsantis, Castleberry; Shotel, Sobe
Clinical practice in design and implementation of educational strate- gies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with

professor. Taught at a demonstration site. Requires eight hours a week in service. (Fall)

262 **Seminar: the Education of Young Exceptional Children** (3) — Sobel, Tsantis, Tiscione, and Staff

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young exceptional children. Must be taken concurrently with SpEd 292. Admission by permission of instructor. (Spring)

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3) — Staff

Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience. (Fall)

264 **The Severely and Profoundly Handicapped Child: Methods and Techniques** (3) — Staff

Specialized programs, techniques, and methods for teaching children with severe disabilities. (Spring, even years)

265 **Clinical Experience with Multiply Handicapped and Developmentally Disabled Young Children** (3) — Ives, Castleberry

Preliminary field experience designed for students with no experience in early childhood special education. Supervised experience necessary for program articulation. Three-week intensive involvement in an early childhood special education setting. (Summer)

266 **The Development of Language in Young Exceptional Children** (3) — Novakovitch

Introduction to the study of language acquisition and the application of current research on language of handicapped children. (Fall)

267 **The Early Childhood Special Educator: A Survey of Roles and Services** (3) — Tsantis, Freund

Examination of the spectrum of roles available in early childhood special education; emphasis on role expectations and psychosocial dynamics of the various settings. (Spring)

268 **The Development of Young Exceptional Children with Emphasis on Handicapping Conditions** (3) — Sobel, Freund, Tiscione

Lecture (2 hours), site visitation (3 hours), discussion (1 hour). (Fall)

269 **Multidisciplinary Theory in Special Education** (3) — Ives, Castleberry, Sobel, Tiscione, Tsantis

Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships. (Fall)

270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum to Meet the Needs of the Special Child** (3) — Staff

Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, alternate years)

271 **The Interdisciplinary Approach to Planning for the Exceptional Child: Theory and Practice** (3 to 6) Freu

Theory of, and field experience in, interdisciplinary team functioni

273 **Seminar for Special Education Strategist Intern** (3 or 6) Ives, Castleberry, Shot

Weekly seminar dealing with experiences, problems, and concer encountered during special education/early childhood strategist i ternship. Concurrent enrollment in SpEd 293 required. (Spring)

290 **Control and Management Techniques for the Young Exceptional Child** (3) Tiscione, Sob

Examination of the theory, techniques, and tools essential for e fective classroom management. Admission by permission of i structor. (Fall)

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9) Sobel, Tsantis, Tiscion Freund, and Staf

Supervised internship in the education of young exceptional chil dren. A minimum of 420 clock hours required. Must be taken con currently with SpEd 282. (Spring and summer)

293 **Professional Internship for the Special Education/Early Childhood Strategist** (6 to 9) Ives, Castleberr Shote

Supervised internship in strategist role, emphasizing diversified multi-dimensional aspects of a special education/early childhood program. A minimum of 420 clock hours is required. Concurrent en rollment in SpEd 273 required. (Spring)

295 **Professional Internship in Vocational/Special Education** (9) Ianacone and Staff

Supervised internship in the vocational/special education of ado lescent handicapped youth, emphasizing the diversified, multi-dimen sional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with SpEd 234. (Spring)

297–98 **Individual Study in Special Education** (3–3) Staff

Individual study or research under guidance of staff member. Pro gram and conferences arranged with advisor. Admission by permis sion of advisor. May be repeated for credit. (Academic year)

303 **Administration and Supervision of Special Education** (3) Botwin

Philosophy and nature of special education; program organization administration, and development. Surveying local needs; program evaluation and supervision. Admission by permission of instructor (Spring)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) Ives, Castleberry Tsantis, Sobel

Theoretical foundations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children. (Spring)

345 **Consultation Skills in Special Education** (3) Shotel

Consultation models from organizational development, organizational

psychology, and mental health applied to in-service training for educational personnel and facilitating appropriate programs for the special child in the public schools. (Spring)

350 **Child Identification and Assessment: The Process of Planning Appropriate Educational Intervention** (3) Staff

Exposes administrators/supervisors to information relative to the exceptional child. Examines etiologies and symptomologies of handicapping conditions, developmental norms, identification and assessment strategies, and individualized educational programming.

351 **Seminar: Developing School/Community Support Systems—Models for Effective Service Delivery** (3) Staff

Provides experiences that facilitate effective service planning for the handicapped child through the examination of existing models of family intervention, curriculum adjustment, and special education service delivery.

352 **Seminar: Legal Issues and Public Policy Concerns in Planning Service Access for the Special Child** (3) Staff

Allows administrators/supervisors to review the responsibilities of their existing roles with regard to requirements generated by the legislative and judicial branches of the government.

360 **Interdisciplinary Techniques in the Diagnostic Process** (3) Tiscione, Tsantis

Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent. (Summer)

370 **Interpersonal Dynamics in Special Education: Attitude Change and the Access Process for the Special Child** (3) Staff

Applies specific psycho-educational constructs germane to successful human interaction to the school administration as interfaced with the public school system and the specific agencies responsible for servicing the special child.

Fourth Group

401 **Doctoral Mini-Seminar in Special Education** (1) Staff

Participation in a small group with a selected faculty member; intensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Fall)

453–54 **Doctoral Internship: Special Education** (6–6) Staff

Supervised professional internship in college teaching, administration, supervision, or private agency function. Each internship individually arranged. Admission by permission of advisor. (Academic year)

490 **Departmental Seminar in Special Education** (3) Shotel

Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Spring)

491 Dissertation Research (arr.) St

Fifth Group

701 Experimental Course (3) St

721 Experimental Course—Interdepartmental (3) St

SPEECH AND DRAMA

Professors J.W. Hillis *(Director of Speech-Language Pathology and Audi logy)*, L.S. Bowling *(Chairman)*, W.M. Reynolds *(Director of Speec Communication)*, L.S. Bielski
Professorial Lecturer G. Herer
Associate Professors M.D.M. Brewer, J.R. Regnell, C.W. Linebaugh, M.S Kernan, J.E. Thiel
Assistant Professors N.C. Garner *(Director of Theater)*, S. Keller *(Directo of Forensics)*, B.W. Sabelli, A.G. Wade, L.B. Jacobson, W.A. Pucilowsky

Bachelor of Arts with a major in dramatic art (departmental)—The followin requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students shoul consult the departmental advisor regarding courses to be taken in satisfyin the requirement for meaningful initiation into the social sciences and th natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—24 semester hours of second-group courses outside the Department of Speech and Drama as approved by the major advisor. (Courses in dramatic literature offered in the classics, English, and foreign language departments are strongly recommended.)
4. Required courses in the major—SpDr 114 or 115, 151, 152 or 195, 165–66 9 additional semester hours in second-group drama courses.

Bachelor of Arts with a major in radio-television (departmental)—The fo lowing requirements must be fulfilled:

1. The general requirements, as stated on pages 74, 81–87. Students shoul consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and th natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—18 semester hours in a single subject area outside the Speech and Drama Department as approved by the major advisor.
4. Required courses in the major—SpDr 49 or 110, 75, 133, 134, 137 or 139 and 145. Twelve hours of second-group courses chosen from the areas o radio-television and film studies, and/or from speech communication, drama and speech pathology/audiology as approved by the major advisor.

Bachelor of Arts with a major in speech communication (departmental) The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students shoul consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—12 semester hours in psychology and/or

philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Speech and Drama as approved by the major advisor.

4. Required courses in the major—SpDr 49 or 110, 75, 133, 134, 137 or 138, and 145. Twelve hours of second-group courses chosen from the areas of radio-television and film studies, nad/or from speech communication, drama, and speech pathology/audiology as approved by the major advisor.

Bachelor of Arts with a non-professional major in speech-language pathology and audiology (departmental)—The following requirements must be fulfilled:

1. The general requirements, as stated on pages 74, 81–87. Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation in the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses—SpDr 1, 11.

3. Required courses in related areas—Psyc 115, 121 and 131 (or their equivalent), plus 15 additional semester hours of second-group courses selected from related areas as approved by the major advisor.

4. Required courses in the major—SpDr 101, 103, 104, 106, 118, 119; six additional semester hours of courses in the Department of Speech and Drama as approved by the major advisor.

Master of Arts in the field of speech-language pathology and audiology—Prerequisite: the degree of Bachelor of Arts with a major in speech-language pathology and audiology from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examination.

Required: the general requirements, pages 91–99. The program of study consists of 36 semester hours of approved course work without a thesis, or with the approval of the department, 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech-Language-Hearing Association.

All students must take the National Examination in Audiology or in Speech Pathology available through the Educational Testing Service. Students must request the Testing Service to send copies of the test scores to the department of speech and drama to be used in the fulfillment of the general requirement in the Graduate School of Arts and Sciences for the Master's Comprehensive Examination. Satisfactory test results must reach the department at least three weeks before graduation.

Master of Fine Arts in the field of dramatic art—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.

Required: the general requirements, pages 91–99. The program of study consists of (1) 30 semester hours of second- and third-group course work planned in consultation with the advisor; (2) a creative thesis (equivalent to six additional semester hours) in the selected area of concentration. Each candidate is expected to complete the program in residence in four continuous academic-year semesters.

Bachelor of Arts in Education and Human Development with a teaching field in speech and drama—Prerequisite: the education curriculum, page 114.

Required: the speech and drama option and the professional courses listed on page 118.

Speech and Hearing Therapy: See Speech and Hearing Clinic, page 54.

First Group

1 **Communicative Speaking and Listening** (3) Reynolds and St
Basic theories and principles of public speaking: research, compo
tion, delivery, and criticism. Recording fee, $5. (Fall and spring

2 **Interpersonal Communication** (3) Reynol
Introduction to the role of verbal and nonverbal transactions
spontaneous, face-to-face encounters. Role-playing, models,
simulations. (Summer)

11 **Voice and Diction** (3) Bielski and Wa
Development of naturalness, correctness, and clarity in convers
tion through the study of phonetics, rate, volume, pitch, and quali
in preparation for performance. Recording fee, $5. (Fall and sprin

45 **Understanding the Theater** (3) Sabe
The art of the theater; its literature, aesthetics, and mechanics. Co
tributions of the playwright, actor, director, and designer examine
through lectures and class discussion. Attendance at theatrical pe
formances and presentations by visiting artists. Primarily for no
majors. (Fall and spring)

49 **Rhetoric in Political and Social Action** (3) Kell
Study of the use and abuse of rhetoric in contemporary politic
and social movements. Theories of persuasion and agitation,
well as means of support considered in various case studies includin
civil rights, anti-Vietnam protests, and women's rights. (Fall)

75 **Sight and Sound** (3)
Development of a critical awareness of auditory and visual com
munication through an introduction to the techniques and aesthetic
of audio-visual media. Lecture (2½ hours), laboratory (2 hours). Pre
requisite: permission of instructor. Laboratory fee, $10. (Fall an
spring)

Second Group

101 **Bioacoustics** (3) Brewe
Acoustic analysis of speech and the physiology of reception an
processing of speech by the human auditory system. Prerequisite
BiSc 3–4 or 11–12 or equivalent; Psyc 1 or 5 or 6 or equivalent
(Fall)

103 **Biophonetics** (3) Linebaug
Biological bases of speech-language production. Emphasis on the
function of the nervous system, the respiratory system, and the voca
and articulatory mechanisms in the production of intelligible speech
Prerequisite: BiSc 3–4 or 11–12 or equivalent; Psyc 1, 5, or 6, o
equivalent. (Fall)

104 **Introduction to Speech-Language Pathology** (3) Regne
Survey of the field of speech-language pathology. The effect of body
system pathologies and environmental factors on the production o
speech and language. Prerequisite: SpDr 103. (Spring)

105–6 **The Writing of Plays** (3–3) Claeyssen
Same as Engl 105–6. Prerequisite: Engl 9 or 10; 11 or 12; consent o

instructor. The student should submit a writing sample to the instructor before registration.

108 **Introduction to Audiology** (3) Brewer

Survey of the field of audiology. The effect of body-system pathologies on the reception of speech and other acoustic stimuli. Procedures of pure-tone and speech audiometry. Clinical and educational services for the hearing impaired. Prerequisite: SpDr 101. (Spring)

110 **Interpretation** (3) Wade

(Formerly SpDr 32)

The study of literature through performance. Interpretation of prose, poetry, and drama. (Fall and spring)

111 **Business and Professional Speaking** (3) Reynolds

Study of the communication process in business and professional organizations; practice in interviewing, preparation and delivery of technical reports, salesmanship, and speeches for special occasions. Primarily for nonmajors. (Fall)

112 **Persuasion** (3) Keller

In-depth study of the principles and techniques of persuasion focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: SpDr 1 or permission of instructor. (Spring)

113 **Voice for the Theater** (3) Jacobson

The practice and application of voice production in four areas: skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual awareness of the process of voice production and its application to dramatic texts. Prerequisite: SpDr 11 and permission of instructor. (Fall)

114 **Introduction to Acting** (3) Jacobson

For non-dramatic art majors. Introduction to the principles of acting for stage and television. Practice in scene work and on-camera performance. (Fall, even years; spring, odd years)

115 **Acting I** (3) Garner

Basic techniques of concentration, imagination, and character analysis. Concurrent registration in HKLS 115 required. Admission by permission of instructor. (Fall)

116 **Acting II** (3) Garner

Principles of role development. Scene study, principally in 20th century realism. Concurrent registration in HKLS 116 required. Admission by audition. Prerequisite: SpDr 115. (Spring)

117 **Audition Techniques** (1)

The course examines all aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: SpDr 115 or the equivalent. (Spring)

118 **Structural Analysis of Speech and Language** (3) Staff

Development of skills in the phonetic/phonemic transcription and syntactic analysis of oral language samples. Prerequisite: Psyc 115 or equivalent. (Spring)

119 Clinical Procedures for Communication Disorders (3) Hi

Development of skill in precision treatment techniques for c
munication disorders. Emphasis on accountability of providers
clinical and educational services for the communicatively han
capped. Prerequisite: Psyc 121 and 131, or equivalent, and permiss
of instructor. (Fall)

121 Group Discussion and Conference Leadership (3) Reyno

Process of thinking and problem-solving in committees and sm
groups; methods of leading discussions and conferences. Prereq
site: SpDr 1 or permission of instructor. (Fall and spring)

126 Argumentation and Debate (3) Reyno

Study of the advocacy system; special emphasis on issue identifi
tion, use of evidence, and logical proof. Extensive practice in ar
mentative speaking. Prerequisite: SpDr 1 or permission of instruct
(Spring)

127–28 Forensic Practice (1–1) Keller and Wa

Student participation in intercollegiate speech activities. May be r
peated for a total of four semester hours of credit. Admission b
permission of instructor. (Fall and spring)

129 TV News: The Politics of Visibility (3) Sta

Joint offering of the Departments of Political Science, Journalism, a
Speech and Drama. Examination of the impact of television o
American politics and society, the nature of coverage of political i
sues and campaigns, the dynamics of selecting and presenting new
stories. (Fall and spring)

132 Radio-Television Performance (3) Sta

Introduction to the basic theories and techniques required for effe
tive, non-dramatic media performance (i.e., announcing, moderati
newscasting, etc.). Prerequisite: SpDr 1, 11, or 110, and permission o
instructor. (Spring)

133 Broadcasting in America (3) Thi

Study of the origins, structure, and nature of American broadcasti
(Fall)

134 Radio Production (3) Sta

Introduction to the basic concepts of radio as a communicatio
medium; emphasis on the design and production technique of
variety of radio programs. Lecture (2 hours), laboratory (2 hours
Prerequisite: SpDr 75 (for radio-television majors), and permissio
of instructor. Laboratory fee, $10. (Fall and spring)

135–36 Radio Workshop (1–1) Staf

Theory and practice in radio station operations. Admission by per
mission of instructor, after one semester of satisfactory participati
in WRGW activities. May be repeated for a total of four semest
hours of credit. (Academic year)

137 Scriptwriting (3) Thei

Study and practice of the forms, techniques, and types of writing
for radio, television, and film. Prerequisite: Engl 11 or 12, and SpDr
75 (for radio-television majors), and permission of instructor
(Spring, odd years)



138 **Scriptwriting: Selected Topics** (3) Wade

Intensive study and practice of a specific genre of radio, television, and film writing. Topics may include adapting the literary text, series and serials, and anthology drama. Prerequisite: Engl 11 or 12, SpDr 75 (for radio-television majors), and permission of instructor. (Spring, even years)

141 **Negotiations and Conflict Resolution** (3) Keller

Communications factors involved in negotiation and conflict resolution. Use of models and simulations to explore prominent-solution approach to conflict situations. (Summer)

143 **Origins of Contemporary Rhetorical Theory** (3) Reynolds

Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)

144 **History and Criticism of American Public Address** (3) Reynolds

Study of American oratory from its pre-Revolution origins to the present day, interpreted in terms of issues and movements. (Spring, odd years)

145 **Introduction to Television Production** (3) Thiel

Basic course in television production techniques and skills. Directing, script-writing, graphics, and other aspects of television production. Extensive practice in working television equipment; emphasis on various in-studio projects. Lecture (2 hours), laboratory (2 hours). Prerequisite: SpDr 134 and permission of instructor. Laboratory fee, $10. (Fall)

146 **Television Directing** (3) Thiel

Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Lecture (2 hours), laboratory (2 hours). Prerequisite: SpDr 145 and permission of instructor. Laboratory fee, $10. (Spring)

147 **Innovations in Television Communication** (3) Staff

Utilization of television technology for non-broadcast purposes (i.e., corporate, medical, legal, therapeutic, artistic, and educational). Prerequisite: SpDr 133 and 145. (Fall, odd years)

148 **Television Production** (3) Staff

Advanced production techniques, with emphasis on the creative and executive aspects of the producer's role. Lecture (2 hours), laboratory (2 hours). Prerequisite: SpDr 146 and permission of instructor. Laboratory fee, $10. (Fall)

149 **Communicative Effects of Broadcast Programming** (3) Thiel

Theories and research pertaining to issues, controversies, and problems of cultural conditioning in American broadcast programming. Prerequisite: SpDr 133. (Spring, even years)

151 **Stagecraft** (3) Pucilowsky

Lecture (2 hours), laboratory (1 hour). Theories and practicum in construction, rigging, and scene painting. (Fall and spring)

152 **Advanced Stagecraft** (3) Sta

Lecture (2 hours), laboratory (1 hour). Theories and practicum in th fundamentals of lighting and sound for the theater and televisio (Fall and spring)

154 **Directing** (3) Garne

Fundamentals of script analysis, casting and rehearsal technique Prerequisite: permission of instructor. Laboratory fee, $10. (Fal

155 **Properties Design** (1) Sabell

Theory and practicum in execution of stage props and set decoratio including thermoplastics sculpture. (Fall, even years)

156 **Make-Up Design** (1) Sabell

Theory and practicum in the art of make-up design, including pros thesis, mask making, laytex. (Spring, odd years)

157 **Stage Management** (1) Sabell

(Formerly SpDr 158)

Fundamental study of stage management with emphasis on practical production work, as well as theory. (Fall, odd years)

158 **Theater Architecture** (1) Sabelli

(Formerly SpDr 159)

Study of general principles, theories, and styles of theater architec ture. (Spring, even years)

163 **Musical Theater** (6) Sabelli and Jacobson

Growth of American musical theater. Development of all its compo nents: libretto, dance, composition, lyrics, and the overall fabric of production. (Summer)

165–66 **History of the Theater** (3–3) Jacobson

An examination of the development and growth of the theater from its beginnings to the present. SpDr 165: Greek through Restoration SpDr 166: the 18th century to the present. (Academic year 1979-8 and alternate years)

171 **Language of Cinema** (3) Kernan

Introduction to cinema as language through analysis of the compo nents of film structure—camera, editing, sound, movement, music, dialogue and mise-en-scene. Class work includes reading, visual com munication exercises and a final project. Admission by permission of instructor. (Fall)

172 **Film Directors and Styles** (3) Kernan

Examination of influence on major film directors of twentieth-century art movements: German expressionism, Soviet constructivism, sur realism, neo-realism and structuralism. Comparison of film narrative with styles in dramatic and visual art forms. (Fall)

173 **History of Cinema** (3) Kernan

Joint offering of the Art and Speech and Drama Departments. An examination of motion picture history in terms of socially struc tured narrative from Griffith to Godard. (Spring)

174 **Special Studies in Film** (3) Kernan

An intensive study of film structure as exemplified by the work of a

single director or film genre. Admission by permission of instructor. (Fall)

175 **The Political Image** (3) Kernan

An analysis of the techniques of propaganda and rhetoric used in film and television to visualize political ideology. Admission by permission of instructor. (Spring, even years)

176 **Film as Fact and Fiction** (3) Kernan

A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. Admission by permission of instructor. (Spring, odd years)

192 **The American Cinema** (3) Kernan

Joint offering of the Speech and Drama Department and the American Studies Program. History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. (Spring)

193 **Scene Design** (3) Sabelli

Fundamental study of scenography, including drafting, rendering and model construction. (Fall)

195 **Costume History and Construction** (3) Pucilowsky

History of fashion in Western civilization from ancient Egypt to the present. Study of basic design principles. Laboratory work in costume construction. (Fall)

196 **Independent Study** (1 to 6) Staff

Independent research and special projects. Open only to undergraduate students in their senior year. Before students are permitted to register for SpDr 196, they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

Third Group

SpDr 268–290 and 295 are for Master of Arts candidates in the field of speech-language pathology and audiology; other students may be admitted by permission of the department.

213 **Special Problems in Speech for the Actor** (3) Jacobson

An advanced study of vocal production and interpretation for the actor. The work will focus on stage dialects, and the articulation and interpretation of Shakespeare's plays. Prerequisite: SpDr 113. (Spring)

215–16 **Acting: Scene Study** (3–3) Jacobson

Scene work in modern, classic, and other nonrealistic drama. Admission by audition. Both courses may be repeated once for credit. Recording fee, $4. (Academic year)

250 **Advanced Scene Design** (3) Sabelli

Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting,

traditional script analysis, and original scenographic interpretatio (Fall)

251 **Special Projects in Scene Design** (3) Sab
Exploration of all styles of traditional and contemporary scen raphy. Admission by permission of instructor. (Spring)

252 **Advanced Costuming** (3) Pucilows
Study of special design, style, and construction problems. (Spri

253 **Problems in Costume Design** (3) Pucilows
The study of pattern drafting and draping methods based on historic costumes through lecture and classwork. Basic millinery construct and design. Prerequisite: SpDr 195. (Spring, even years)

255 **Lighting Design** (3) Sabe
Theory and execution of lighting design for theater and televisio Prerequisite: SpDr 152. (Spring)

256 **Directing Seminar** (3) Garn
Problems in directing plays from selected periods. May be repeate for credit. (Spring)

257 **Modern Trends** (3) Sta
Study of recent developments in dramatic theory, literature, an production. (Fall, even years)

258 **Theater Management** (3) Sta
Theory and practice in theater management: promotion, box offic and house management. Admission by permission of instructo (Fall, odd years)

261–62 **Theatrical Styles** (3–3) Pucilowsk
Detailed study of the culture, climate, and production techniques o significant periods of drama. Prerequisite: SpDr 165–66. (Academi year)

267 **Interdisciplinary Study of Language Disorders** (3–6) Staf
For graduate students in education, speech and hearing, and psy chology. Psycho-educational team participation, team diagnosis an analysis of case studies. Multidisciplinary understanding of philoso phies of learning and treatment of symbolic malfunctioning. Admis sion by permission of instructor. (Fall and spring)

268 **Clinical Practice in Communication Disorders** (1–3) Staf
Supervised clinical practice in the evaluation and treatment of com munication disorders. May be repeated for a total of three semest hours of credit. (Fall and spring)

269 **Community Programs in Communication Disorders** (3) Here
Methods and procedure for the planning, management, and opera tion of hospital, school, and other community programs for the communicatively handicapped. (Fall)

271 **Evaluation of Speech Articulation Disorders** (2) Regnel
Evaluation of persons with speech articulation disorders: staffing o clinical cases, test demonstrations, critical evaluations of speech articulation testing procedures. Laboratory fee, $5. (Fall)

272 **Etiology of Speech Articulation Disorders** (2) Hillis

Biological, linguistic, and psychological bases for disorders of speech articulation; staffing of clinical cases. Laboratory fee, $5. (Spring)

273 **Treatment of Speech Articulation Disorders** (2) Regnell

Treatment procedures of persons with disorders of speech articulation; emphasis on programmed and other objective procedures for the improvement of speech articulation; staffing of clinical cases. Laboratory fee, $5. (Summer)

274 **Evaluation of Speech Fluency Disorders** (2) Hillis

Theories of the etiology of stuttering and related disorders; procedures for evaluating fluency disorders. Laboratory fee, $5. (Fall)

275 **Treatment of Speech Fluency Disorders** (2) Hillis

Treatment procedures for disorders of speech fluency. Laboratory fee, $5. (Spring)

276 **Speech Fluency Disorders in Children** (2) Hillis

Developmental aspects of stuttering; evaluation and treatment of fluency disorders in children. Laboratory fee, $5. (Summer)

277 **Clinical Evaluation of Language Disorders** (3) Staff

Evaluation of language disorders in children and adults; class staffings of language pathology cases, test demonstrations, and critical evaluations of formal and informal language testing procedures. Laboratory fee, $7.50. (Fall)

278 **Applied Research in Language Disorders** (3) Linebaugh

Current neurolinguistic and psycholinguistic research related to language pathologies in children and adults; emphasis on the treatment of aphasia in adults including demonstrations of objective procedures for charting clinical progress. Laboratory fee, $7.50. (Spring)

279 **Clinical Treatment of Language Disorders in Children** (3) Linebaugh

Current language therapy programs for children and critical evaluation of these programs in light of modern psycholinguistic concepts; emphasis on objective procedures for attaining or modifying goals in language therapy for children with various handicapping conditions. Laboratory fee, $7.50. (Summer)

280 **Functional Voice Disorders** (2) Regnell

Review of the normal structure and function of the vocal mechanism, acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with functional voice disorders. Laboratory fee, $5. (Fall)

281 **Alaryngeal Speech** (2) Regnell

Acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for laryngectomized persons. Laboratory fee, $5. (Spring)

282 **Organic Voice Disorders** (2) Regnell

Acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with organic voice disorders; special consideration given to the management of voice disorders in children. Laboratory fee, $5. (Summer)

283 **Aural Rehabilitation** (3) Brew

Systems, principles, and methods of auditory training and spee reading, including development of lesson plans and their applicati in resolving communication problems of acoustically-handicapp individuals. Laboratory fee, $7.50. (Fall)

284 **Advanced Clinical Audiology** (3) Bowlin

Principles and methods underlying assessment of auditory disorde emphasis on bone conduction, masking, and speech intelligibilit Clinical implications, tests; demonstration and practicum. Laborato fee, $7.50. (Fall)

285 **Hearing Aids** (3) Brew

Discussion of hearing-aid characteristics and electroacoustic mea urements; hearing-aid effectiveness in improving communicative eff ciency; procedures for selection and clinical evaluation of hearin aids; counseling of the patient. (Spring)

286 **Special Auditory Tests** (3) Bowlin

Special speech and pure tone audiometric techniques for differen tiating conductive, cochlear, and retro-cochlear lesions, for identify ing functional hearing losses. Clinical application of tests and inter pretation of results. Laboratory fee, $7.50. (Fall)

287 **Auditory Processing** (3) Bowlin

Detailed study of the factors which affect auditory perception and comprehension; methods and procedures used in identifying dis orders of auditory perception and comprehension. Laboratory fee $7.50. (Spring)

288 **Psychosocial Aspects of Hearing Loss** (3) Bowlin

Consideration of the rationale and procedures for evaluating the social and emotional behavior as well as the intellectual potential of those with impaired hearing. Laboratory fee, $7.50. (Spring)

289 **Impedance Audiometry and Middle Ear Function** (3) Staff

Development of skills in impedance audiometry and audiological assessment of middle ear function. Laboratory fee, $7.50. (Spring)

290 **Management of the Hearing-impaired Child** (3) Brewer

Overall management approach to the hard-of-hearing child including diagnosis, parent counseling, amplification, educational placement, treatment programs and procedures, and re-evaluation. Laboratory fee, $7.50. (Summer)

292 **Language Intervention in the Schools** (3) Staff

Analysis of language performance problems of school children and development of intervention strategies. For special education teach ers, learning disabilities specialists, remedial reading specialists audiologists, speech pathologists, and teachers of the hearing-im paired. Professional experience in one of these fields is recommended but not required. (Summer)

294 **Independent Research in Dramatic Art** (arr.) Staff

May be repeated for credit. (Fall and spring)

295 **Independent Research in Speech-Language and Hearing** (arr.) Staff

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

STATISTICS

Professors H.F. Bright, S. Kullback *(Emeritus)* H.W. Lilliefors *(Chairman)*, A.D. Kirsch, R.H. Shumway, J.L. Gastwirth, L. Shaw *(Research)*, N. Mantel *(Research)*, D. Krueger *(Research)*, S.W. Greenhouse, N.D. Singpurwalla *(Research)*, M. Halperin *(Research)*, W. Weiss *(Research)*
Professorial Lecturer J. Bailar III
Associate Professors C.T. Ireland, R.E. Thomas, J.M. Lachin III *(Research)*
Associate Professorial Lecturers K.M. Wolter, P.P. Biemer, W. Rutiser
Assistant Professor J.K. Kern
Assistant Professorial Lecturers T.C. Teeples, N.J. Kirkendall, R. Jacob

Bachelor of Arts or Bachelor of Science with a major in applied statistics (departmental) or mathematical statistics (departmental) or statistics with an option in computer science (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74, 81–87. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for all three majors—Math 31, 32, 33; Stat 91.

3. (a) Required course for the applied statistics major—Math 124. (Courses in computer science and some field of application are recommended. Foreign language is not required for this major.)

(b) Required courses in related areas for the mathematical statistics major—Math 124, 139, 140, 157; two years of introductory French, German or Russian, or equivalent. (Courses in computer science, mathematics, and some field of application are recommended.)

(c) Required courses for the statistics major with an option in computer science—Math 33, 113, 124. (Foreign language is not required for this major, but it is recommended for students planning to go to graduate school.)

4. (a) Required courses in the applied statistics major—Stat 106, 110, 117, 118, 157–58, 189; plus three approved second-group courses in statistics.

(b) Required courses in the mathematical statistics major—Stat 106, 117, 118, 157–58, 189–90; plus three approved second-group courses in statistics.

(c) Required courses in the statistics major with an option in computer science—Stat 106, 110, 114 (in that order), 117, 118, 157–58; plus two approved electives in mathematics and statistics (Math 101, 153, 270, and Stat 189 and 198 are recommended).

To assure a balanced program, departmental approval of electives is required for all majors.

Students who seek Special Honors in statistics should inquire of the Department for a statement of its policy.

Minor in statistics--

1. General minor (with calculus): Stat 91, 117, 118, 157, 158, and 97 or 106 or 197.

2. Applied minor (without calculus): Stat 53, 105, 118, 187 or 188, and 97 or 197.

3. Computer science minor (with calculus): Stat 91, 106, 110, 114, and 198.

Master of Science in the field of applied statistics or *Master of Arts in the field of mathematical statistics*—The program of study consists of 30 semester

hours of course work without a thesis. In exceptional cases the department m
approve a program of study consisting of 24 semester hours of course wo
plus a thesis, equivalent to six additional semester hours. Candidates must p
a written Master's Comprehensive Examination and must fulfill the tool
quirement by passing either a reading knowledge examination in an accepta
foreign language or an examination in computer language. For prerequisites a
additional requirements, see below.

Master of Science in the field of applied statistics—Prerequisite: a bachelo
degree with a major in applied statistics from this University, or an equivale
degree. If undergraduate study did not include equivalent required course
those courses must be taken as prerequisite to graduate study.

Required: the general requirements, pages 91–99, including Stat 201-
Courses are selected in consultation with the advisor.

Master of Arts in the field of mathematical statistics—Prerequisite: a bach
lor's degree with a major in mathematical statistics from this University, or a
equivalent degree. If undergraduate study did not include equivalent require
courses, those courses must be taken as prerequisite to graduate study.

Required: the general requirements, pages 91–99, including Stat 201-2 an
217–18. The remaining 18 semester hours must be selected in consultation wit
the advisor.

Doctor of Philosophy in the field of mathematical statistics—Prerequisite
the degree of Master of Arts in the field of mathematical statistics from th
University, or an equivalent degree.

Required: the general requirements, pages 91–93, 99–101. A minimum of 2
semester hours of course work must be taken in residence at this University
before the General Examination may be completed. The General Examinatio
consists of two written parts, each followed by an oral examination. Part I cover
mathematics and probability and may be taken after successful completion o
Stat 259–60 or 273–74. Part II may be taken after the successful completion o
the remaining core courses (Stat 201–2, 217–18, 257–58, 263–64, 265–66, 287) an
electives selected in consultation with the advisor. The tool requirement ma
be fulfilled by passing a reading knowledge examination in one foreign lan
guage and an examination in computer language. The successful completion o
course work in computer programming does not obviate the requirement to
pass a special examination should the computer option be elected as a tool.

Research Fields: Bayesian inference, biostatistics, design of experiments, in
formation theory, multivariate analysis, nonparametric statistics, probability
robust methods, sampling, statistical inference, stochastic processes, and time
series analysis.

Departmental prerequisite: One entrance unit in algebra is prerequisite to all
first-group courses in statistics.

First Group

***51 Introduction to Business and Economic Statistics** (3) Bright, Kern

Lecture (3 hours), laboratory (1 hour). Frequency distributions, de
scriptive measures, probability, sampling, estimation, tests of hy
potheses, regression and correlation, times series, index numbers
Laboratory fee, $18. (Fall and spring)

* Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only one
of the five may be applied toward a degree.

*53 **Introduction to Statistics in Social Science** (3) Staff

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

*91 **Principles of Statistical Methods** (3) Lilliefors

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. (Fall and spring)

†97 **Introduction to Computer Programming** (3) Staff

Lecture (2 hours), laboratory (2 hours). Computer and programming concepts. High-level language programs written by students will be run on the University computer. Laboratory fee, $25. (Fall and spring)

Second Group

103 **Sampling in Accounting** (3) Bright

Special emphasis on applications of sampling techniques to business decisions and to auditing; simple and stratified samples; cluster samples; opinion polling. Prerequisite: Stat 51, 53, 91, or equivalent. (Spring)

105 **Statistics in the Behavioral Sciences** (3) Kirsch

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or equivalent, and satisfactory performance on a placement examination. (Fall and spring)

106 **Introduction to Computing** (3) Thomas

Development of basic computing ideas using a high-level language. Emphasis on careful design and implementation of programs using "structured programming." Prerequisite or concurrent registration: Math 31, or permission of the instructor. Laboratory fee, $25. (Fall)

110 **Computer Programming** (3) Thomas and Staff

Lecture (2 hours), laboratory (2 hours). Computer concepts beyond the introductory level; an introduction to assembly language and advanced high-level language programming. Prerequisite: Stat 106. Laboratory fee, $25. (Spring)

*111 **Business and Economic Statistics I** (3) Thomas and Gastwirth

Statistical methods appropriate for applications in economics and business. (Fall)

112 **Business and Economic Statistics II** (3) Thomas and Gastwirth

Continuation of Stat 111 with emphasis on techniques of regression, Chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring)

* Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.
† Credit will not be given for both Stat 97 and Stat 197.

114 **Data Structures** (3) St

Files and file systems. Basic structure of processing operations, c tion updating, sorting, merging, searching, linkage, hashing. Introd tion to data processing, storage, and retrieval. Emphasis on c puter techniques. Prerequisite: Stat 110. Laboratory fee, $25. (F

117 **Analysis of Variance** (3) St

Lecture (3 hours), laboratory (1 hour). Introduction to the design experiments and analysis of variance; random block, factorial, La square, and analysis of covariance. Prerequisite: Stat 118. Laborat fee, $18. (Spring)

118 **Regression Analysis** (3) St

Lecture (3 hours), laboratory (1 hour). Regression and correlati theory; simple, partial, and multiple. Prerequisite: 3 semester ho selected from Stat 51, 53, 91. Laboratory fee, $18. (Fall and spri

119 **Bases of Statistical Decision-making** (arr.) Ke

For students in the Navy Graduate Financial Management Progr only. Introduction to techniques of decision-making; emphasis applications rather than theory.

123 **Introduction to Econometrics** (3) St

Joint offering of the Departments of Statistics and Economi Construction and testing of economic models: regression theor parameter estimation, and statistical techniques applicable to ec nomic models. Prerequisite: Econ 101, 102; Math 31 or 51; Stat 1 (Fall and spring)

*127 **Statistics for the Biological Sciences** (3) Greenhou

Introduction to statistical techniques and reasoning applicable to t biomedical and related sciences. Properties of basic probability fun tions: binomial, Poisson, and normal. Data analysis, inference, a experimental design. (Fall and spring)

131 **Contingency Table Techniques** (3) Sta

Analysis of multidimensional contingency tables, including estim tion, tests of hypotheses, and log-linear regression. Prerequisite: St 118 or permission of instructor. Laboratory fee, $18. (Summer,

153–54 **Mathematical Models in Population Genetics** (3–3) Staf

Basic elements of genetics and cell reproduction, deterministic mod of gene frequency; the Hardy-Weinberg law; effects of mutatio migration, and selection on gene frequency; multiple loci and multip allele models; inbreeding; Fisher's fundamental theorem of natur selection; stochastic models of changes in gene frequency, includin methods of direct product branching processes and diffusion equatio methods. (Academic year)

155 **Introduction to Probability** (3) St

Probability distribution, Bayes' theorem and postulate, mathematic expectation, laws of large numbers. Prerequisite: one entrance u in algebra.

157–58 **Introduction to Mathematical Statistics** (3–3) St

Distribution theory, sampling theory, estimation, hypothesis testin

*Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only of the five may be applied toward a degree.

regression analysis, experimental design. Prerequisite: differential and integral calculus. (Academic year)

159 Principles of Bayesian Statistics (3) **Staff**

Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semester hours in introductory statistics, or equivalent.

161–62 Information Theory (3–3) **Staff**

Elementary development of information theory and applications to communication, coding, psychology, linguistics, etc. Prerequisite: three semester hours selected from Stat 155, 157, 159, 189. Laboratory fee, $15.

165–66 Multivariate Techniques (3–3) **Shumway**

Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 117, 157–58, and Math 124. Laboratory fee, $18. (Academic year)

181 Applied Time Series Analysis (3) **Shumway**

Auto- and cross-correlation, spectral analysis, coherence, transfer relations, linear filters, seasonal adjustment, mean square regression, autoregressive moving average models, forecasting, Box-Jenkins methods, spectral analysis of variance, and signal detection and discrimination methods. Prerequisites: a first course in statistics, calculus. Laboratory fee, $30. (Spring)

183 Intermediate Statistical Laboratory (3) **Staff**

Applications to advanced experimental design and other topics. Admission by permission of instructor. Laboratory fee, $25. (Fall or spring)

187 Theory of Sampling (3) **Staff**

Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 Nonparametric Statistical Inference (3) **Lilliefors**

Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 Mathematical Probability and Applications (3–3) Staff

Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

193 Survey Design (3) **Staff**

Applications of survey methodology, including questionnaire design and wording, field methods, interviewer and nonresponse biases, and quality-control procedures. Problems in sample frame development. Prerequisite: Stat 187 or equivalent, and permission of instructor. (Spring)

195 Reading and Research in Statistics (arr.) **Staff**

May be repeated once for credit. (Fall and spring)

*197 **Digital Computer Programming with Applications** (3) Thor

Lecture (2 hours), laboratory (2 hours). Use of digital compute statistical and other computational work. Writing, debugging, running programs on the digital computer in the University C puter Center. Prerequisite: Stat 118; or Math 32; or permission instructor. Laboratory fee, $25. (Fall and spring)

198 **Current Topics in Computer Programming** (3) Ruti

Concepts of programming, programming languages, operating s tems, nonnumeric programming compiler techniques. Prerequis Stat 114 or permission of instructor. Laboratory fee, $25. May be peated for credit. (Spring)

Third Group

201–2 **Mathematical Statistics** (3–3) Irela

Distribution theory, sampling theory, estimation, sufficient statisti hypothesis testing, analysis of variance, multivariate normal distrib tion. Prerequisite: advanced calculus or permission of instruct (Academic year)

205 **Data Analysis for Policy Decisions** (3) Kirsc

The framing of questions of importance in policy and the use existing data bases to answer these questions. Laboratory fee, $ Prerequisite: Stat 105 or equivalent. May be repeated once for cred (Summer)

206 **Factor Analysis** (3) Kirsc

Concepts of factor analysis and their utility in various phases of re search and related topics, including cluster analysis. Prerequisite Stat 105 or equivalent and permission of instructor. Laboratory fe $18. (Summer)

217–18 **Advanced ANOVA and Experimental Design** (3–3) Sta

Advanced theory and application of general linear hypothesis to ex perimental designs. Prerequisite: Stat 157–58 or 201–2; Math 12 (Academic year)

221 **Design of Experiments for Behavioral Sciences** (3) Kirsc

Applications of advanced experimental design to research problem in behavioral sciences and education. Prerequisite: Stat 105 or 118 o equivalent and permission of instructor. Not open to graduate stu dents in Statistics. (Spring)

223–24 **Bayesian Inference** (3–3) Staf

Systematic development of Bayesian viewpoint, with applications t the classical problems of statistics. Prerequisite: Stat 201–2. (Ac demic year 1979–80 and alternate years.)

225–26 **Introduction to Biostatistics** (3–3) Staf

Probability models, inference, and study design as applied to bio medical investigations. Prerequisite: Stat 201–2. (Academic yea 1980–81 and alternate years.)

231 **Contingency Table Analysis** (3) Staf

A study of the theoretical bases underlying the analysis of categoric data. Prerequisite: Stat 201–2 or 257–58.

* Credit will not be given for both Stat 97 and Stat 197.

242 **Advanced Statistical Problems in Economic Analysis** (3) — Gastwirth

Applications of advanced theory to economic data. (Spring)

257–58 **Distribution Theory** (3–3) — Staff

Properties of distribution and characteristic functions, probability bounds, large- and small-sample theory, order statistics. Prerequisite: Stat 157–58 or 201–2. (Academic year 1979–80 and alternate years.)

259–60 **Advanced Mathematical Probability** (3–3) — Staff

Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: Math 224 or equivalent. (Academic year 1980–81 and alternate years.)

261 **Sequential Design and Analysis** (3) — Staff

Wald's theory of sequential designs, optional stopping, choice of sequential experiments. Prerequisite: Stat 201–2. (Spring, odd years.)

262 **Nonparametric Inference** (3) — Lilliefors

Inference when the form of the underlying distribution is unspecified. (Fall, odd years.)

263–64 **Topics in Statistical Inference** (3–3) — Lilliefors

Estimation, testing of statistical hypotheses, tests of significance, likelihood ratio, Bayesian inference and the use of prior knowledge, decision theory. Prerequisite: Stat 201–2 or 257–58. (Academic year 1980–81 and alternate years.)

265–66 **Multivariate Analysis** (3–3) — Shumway

Tests of significance, homogeneity, independence, canonical and vector correlations, multivariate normal distribution, generalized Student's ratio, multivariate linear hypothesis, and analysis of variance. Prerequisite: Stat 201–2 or 257–58; Math 124. (Academic year 1979–80 and alternate years.)

269 **Statistical Decision Theory** (3) — Staff

Wald's theory of decision functions. Sequential analysis. Multi-decision problems. Existence theorems, complete class theorems, and other general decision theoretic results. Prerequisite: Stat 189–90: and 201–2 or 257–58. (Fall, even years.)

273–74 **Stochastic Processes** (3–3) — Staff

Fundamental notions of Markov chains and processes, generating functions, recurrence, limit theorems, random walks, Poisson processes, birth and death processes, applications. Prerequisite: Stat 189–90; and 201–2 or 257–58. (Academic year 1979–80 and alternate years.)

275 **Econometrics I: Introduction** (3) — Staff

Joint offering of the Departments of Statistics and Economics. Single-equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equations problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Recommended: a course in matrix theory. (Fall)

276 **Econometrics II: Simultaneous Equations Models** (3) S

Joint offering of the Departments of Statistics and Econom Economic models and simultaneous equations systems. Prerequis Stat 275. (Spring)

279 **Methods in Economic Statistics** (3) Gastwi

Joint offering of the Departments of Statistics and Econom Statistical methods, such as regression, curve fitting, and index nu bers used to summarize and analyze economic data. Prerequis Stat 111 or equivalent. (Fall and spring)

281 **Time Series Analysis I: Foundations** (3) Shumw

Basic structure of stationary time series. Differentiation, integrati spectral representations, linear filtering, mean square estimation, Finite Fourier Transform, laws of large numbers, autoregressive m ing average processes. Prerequisite: Stat 201–2 and 259–60 or 273– (Fall, even years.)

282 **Time Series Analysis II: Statistical Inference** (3) Shumw

Multivariate normal processes, spectral estimation, tests of potheses, regression, discrimination filtering, spectral analysis variance. Prerequisite: Stat 281. (Spring, odd years.)

283 **Advanced Statistical Laboratory** (3) St

Application of the University computer to complex statistical pro lems on an individual study basis. Admission by permission of structor. Laboratory fee, $25. May be repeated for credit only wi permission of the Department. (Fall and spring)

285–86 **Seminar: Special Topics in Sample Survey** (3–3) Wolf

Admission by permission of instructor. (Fall and spring)

287–88 **Modern Theory of Sample Surveys** (3–3) Wolf

Application of statistical theory to the sampling of finite populatio Simple, stratified, cluster, double and subsampling. Special topic including super-populations and randomized response. Prerequisite Stat 91 and Math 32 or equivalent. (Academic year)

289 **Seminar** (3) St

Admission by permission of instructor. (Fall and spring)

290 **Principles of Demography** (3) St

Joint offering of the Departments of Economics, Geography and R gional Science, Sociology, and Statistics. Introduction to bas demographic perspectives and data; methods for analysis of popu tion size, distribution, and composition; determinants and cons quences of population trends. (Fall)

291 **Methods of Demographic Analysis** (3) St

Joint offering of the Departments of Economics, Geography and R gional Science, Sociology, and Statistics. Basic methods for analys of mortality, natality, and migration; population estimates a projections; estimation of demographic measures from incompl data. (Spring)

295 **Reading and Research** (3) St

May be repeated once for credit. (Fall or spring)

297 **Problems in Mathematical Statistics** (3) **Staff**

298 **Seminar: Special Topics** (3) **Staff**

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

378 **Seminar: Topics in Econometrics** (3) **Staff**
Joint offering of the Departments of Statistics and Economics. Limited to graduate students, primarily for doctoral students; offered as demand requires. A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

URBAN AND REGIONAL PLANNING—GRADUATE PROGRAM

Professor D.C. McGrath, Jr. *(Chairman)*
Associate Professors S. Greene, S.S. Fuller, J.N. Pearce
Associate Professorial Lecturer D. Myhra
Assistant Professor D. Gale
Visiting Lecturer O.T. Carr, Jr.

A program leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field, and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration, Doctor of Business Administration, and Doctor of Public Administration, are offered by the School of Government and Business Administration (see pages 134–64).

Second Group

153 **Principles of Urban Planning and Design** (3) **Greene**
Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Fall)

Third Group

201 **Introduction to Urban and Regional Planning** (3) McGrath and Staff
Introduction to history, concepts, and activities of urban and regional planning. Discussion of trends in urbanism and the influences of technology and social change. (Fall and spring)

202 **Urban Planning Theory** (3) **Gale**
Development of the fundamental theories and concepts of urban growth and change, theories of the planning process, the role of

politics in the planning process, and roles of the planner. Prere site: U&RP 201 or permission of instructor. (Fall and spring)

203 Fundamentals of Urban Design (4) Gre

Planning and design studio to develop and apply planning meth and graphic techniques, principles of land use and urban des analysis of factors affecting community development and cha Open only to candidates for the degree of Master of Urban and gional Planning. Laboratory fee, $20. Prerequisite: U&RP 201 and or permission of instructor. (Spring)

204 Urban Development Planning (3) Gre

Planning and design studio: investigation of social, environmen and technological factors in planning. Application of comprehens planning process to typical problems of community growth and velopment. Laboratory fee, $20. Prerequisite: U&RP 203 or permiss of instructor. (Fall)

205 Urban Housing (3) Ful

Examination of the building industry, housing market characteristi analytical techniques, national needs, costs, financing, federal p grams, technology, rehabilitation, and policy formulation. Prereq site: U&RP 201. (Spring)

206 Community Facilities Planning (3) Ful

Planning implications of essential public facilities which compri community infrastructure. Emphasis on developing an understandi of the special design, service, and locational requirements of ea class of community facility, the relationships among facilities a their effects on urban development and the community at large. Pr requisite: U&RP 201 or permission of instructor. (Spring)

207 Land Development Planning (3) McGra

Selected problems in urban and regional planning: applications zoning, urban renewal and special programs available for the imp mentation of development plans. Prerequisite: U&RP 201 or perm sion of instructor. (Fall)

208 Urban Transportation Planning (3) McGra

Relationships between land use and the movement of goods a people in urban areas. Transportation planning principles, polic problems, methods for analyzing demand and systems for urb travel; roles of public agencies and private interests in the planni and development of various modes. Prerequisite: U&RP 201. (Spring)

210 Urban Development Economics (3) Sta

Economic forces affecting urban growth and change; relationshi among cities, metropolitan areas, and regions in the context of t national economy; socioeconomic implications of urban land develo ment policies; basic studies and methods of economic analysis. Pr requisite: Econ 217–18 or equivalent; U&RP 201. (Spring)

212 Methods of Urban and Regional Analysis (3) Ful

Introduction to methods used to analyze, estimate, and forecast pop lation, employment, income and economic growth and developme Includes time series, index numbers, sampling, regression, shift-shar and input-output. Prerequisite: Stat 51 or equivalent. (Fall)

213 **Social Factors in Urban Planning** (3) Gale
Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns. Effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer)

215 **Advanced Planning Problems** (4) McGrath and Staff
Investigation of complex problems of the metropolitan region, analysis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and individual planning projects. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203. (Spring)

218 **Metropolitan and Regional Planning** (3) Fuller
Multidisciplinary study of the methods of regional analysis and process of regional planning; development of projects of regional scale requiring problem analysis, synthesis, and plan formulation. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203 and 212 or permission of instructor. (Fall)

232 **Urban Environment and the Planner** (3) Fuller
Exploration of the relationship between people and their urban environment; emphasis on the role of the urban planner. Theory, research, planning methods, current issues, and laws examined. Prerequisite: U&RP 201 or permission of instructor. (Spring)

240 **Federal and State Urban Policy Development** (3) Gale
Investigation of contemporary trends in the evolution of federal and state governmental functions and programs affecting urban growth and development policy. Planning functions in the evolving relationships among units of federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or permission of instructor. (Spring)

242 **Fiscal Policy and Urban Planning** (3) Gale
Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital projects financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall)

276 **U. S. Architectural History** (3) Pearce
Joint offering of the American Studies Program and the Urban and Regional Planning Department. Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

277–78 **Historic Preservation** (3–3) Pearce
Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program. The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural and humanistic values affecting preservation activities. (Academic year)

290 **Special Topics in Urban and Regional Planning** (3) Staff
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Research Methods** (3)
Directed research and investigation of special problems in commu development. May be repeated once for credit. (Fall and spr

298 **Directed Readings and Research in Urban and Regional Planning** (3)

299 **Thesis Seminar** (3)
Examination of thesis standards, research philosophy and meth ology. (Fall and spring)

300 **Thesis Research** (3)
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as demand requires. They are open to other graduate students at the discretion the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwo
An analysis and critique of alternative theoretical frameworks f describing, understanding, and predicting the nature, values, a actions of American public and private institutions. Problems, pote tials, and alternatives for structuring public and private institution arrangements to meet the needs of society.

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Business Administr tion or Doctor of Public Administration general examination. May repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Business Administration or Doctor of Publ Administration candidates. May be repeated for credit. (Fall an spring)

WOMEN'S STUDIES—GRADUATE PROGRAM

Assistant Professor P.M. Palmer *(Coordinator for Academic Affairs)*
Adjunct Assistant Professor E. Bloomfield

Committee on Women's Studies

V.R. Allan, E. Bloomfield, M.M. Cassidy, C.W. Conable, S.E. Haber, T.J. Lavine, P.M. Palmer, S. Quitslund, S.J. Tolchin, R. Wallace

The Graduate School of Arts and Sciences offers an interdisciplinary progra leading to the degree of Master of Arts in Special Studies with a concentrati in Women's Studies, directed by the Committee on Women's Studies and dra ing upon faculty from various departments within the university and resour persons in the community.

Women's studies seeks to examine and integrate the contributions of estab lished academic disciplines to an understanding of the historical and contem porary role and status of women, and to provide training necessary to evalua

and formulate equitable public policy for women. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective candidates should consult with the director of the Women's Studies Program.

Master of Arts in Special Studies with a concentration in Women's Studies—Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements, pages 91–99, and 36 semester hours of course work, with or without a thesis. At least 21 hours must be taken in arts and sciences departments. WStu 220, 225, and 241 are required for all students; WStu 283 and 295 are required for students who do not elect a thesis; WStu 299–300 are required for those who do elect a thesis. A graduate-level methodology course in one of the social sciences is required. A maximum of 24 hours in women's studies is permitted. The remaining hours must be divided between two other fields. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

220 Perspectives on Women (3) Palmer

Research and theory from the social sciences and humanities as they influence the concept of public policies on women at work, in families, and in education. (Spring)

221 Research Issues in Women's Studies (3) Staff

Socialization and the educational system, work and the economy, sexuality and the family, health and life cycle issues. Problem identification in these and other areas; introduction to current research. Prerequisite: WStu 220. (Fall)

225 Feminist Theory (3) Palmer

Theoretical foundations of feminism in the U.S. Theories and proposals for change currently espoused. Although focus is primarily on feminism of contemporary white America, some third world and European thought will be considered. (Fall)

235 Women's Careers: Work, Family, and Educational Choices (3) Staff

Multidimensional analysis of factors, theories, problems, and practices in career development and its relationship to counseling women. (Fall)

240 Public Policy (3) Staff

Systematic analysis of public policy formation at the federal, state, and local levels as it relates to the status of women. Strategies for change and impact of the women's movement. Team and individual research projects on executive decision-making, legislation and its implementation, and political party structures. (Spring)

241 Women and the Law (3) Bloomfield

Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Fall and spring)

251 Women, Literature, and the Arts Staff

Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Spring)

260 **Women in the American Work Force** (3) Pal

Joint offering of the American Studies Program and the Wom Studies Program. Multidisciplinary analysis of women's role in labor force and historical changes in that role. Societal view women's work in the home and outside it; interrelationship women in and out of the work force; women's contributions, t tionally and during national crises; class, race, and ethnic differe (Fall)

270 **Seminar: Selected Topics** (arr.) S

280 **Independent Study** (3) S

May be repeated for credit. Arrangements must be made with s soring faculty member prior to registration.

283 **Practicum in Women's Studies** (3) Pal

Study of the changing status of women through supervised ass ment to public and private agencies engaged in education, counse political action, and research. Placement arrangements should b the semester prior to registration for this course.

284 **Practicum** (arr.) Pal

295 **Independent Research in Women's Studies** (arr.) S

Individual library or field research. Program advisor's approval written proposal required.

299–300 **Thesis Research** (3–3) S

YIDDISH

See **Classics.**

ZOOLOGY

See **Biological Sciences.**

FACULTY AND STAFF OF INSTRUCTION

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

School of Public and International Affairs

EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1928, University of Chicago; Ph.D. 1932, University of Wisconsin

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Ruth Harriet Atwell, *Professor Emeritus of Physical Education for Women*
Ph.B. 1918, Denison University; M.A. in Ed. 1933, George Washington University

Richard Adrian Barrett, *Professor Emeritus of Business Administration*
B.A. 1930, Amherst College; M.B.A. 1932, Harvard University; D.B.A. 1972, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1936, Johns Hopkins University

Robert Whitney Bolwell, *Professor Emeritus of American Literature*
B.A. 1916, Case Western Reserve University; M.A. 1917, Ph.D. 1921, Columbia University; Litt.D. 1957, George Washington University

John Withrow Brewer, *Professor Emeritus of Political Science and International Law*
B.A. 1926, M.A. 1930, Ph.D. 1932, Princeton University

Arthur Edward Burns, *Professor Emeritus of Economics*
B.A. 1931, M.A. 1934, University of California, Berkeley; Ph.D. 1935, George Washington University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University, England

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

Richard Bernard Castell, *Director Emeritus of the Student Health Service*
B.A. 1932, M.D. 1935, George Washington University

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Elbridge Colby, *Professor Emeritus of Journalism*
B.A. 1912, M.A. 1913, Ph.D. 1922, Columbia University

Oswald Symister Colclough, *Professor Emeritus of Law; Dean of Faculties Emeritus; Emeritus Director of the Patent, Trademark, and Copyright Research Institute*
B.S. 1920, U.S. Naval Academy; LL.B. 1935, Sc.D. 1961, George Washington University; LL.D. 1946, Muhlenberg College

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

George Frederick Conner, *Associate Professor Emeritus of Business A ministration*
B.S. 1929, U.S. Military Academy; M.B.A. 1938, Harvard University

Milton Crane, *Professor Emeritus of English*
B.A. 1937, M.A. 1938, Columbia University; M.A. 1941, Ph.D. 1942, Harvard University

Vincent James DeAngelis, *Professor Emeritus of Physical Education*
B.S. in P.E. 1939, M.A. in Ed. 1948, George Washington University

Alan Thomas Deibert, *Professor Emeritus of Romance Languages*
B.A. 1918, Gettysburg College; M.A. 1922, Harvard University

James Carlton Dockeray, *Professor Emeritus of Finance*
B.A. 1929, Ohio Wesleyan University; M.A. 1931, Ph.D. 1936, Ohio State University

William Rankin Duryee, *Research Professor Emeritus of Pathology (E perimental)*
B.A. 1927, Ph.D. 1933, Yale University

Frederick Harrell Gibbs, *Professor Emeritus of Health Care Administrati*
B.S. 1956, University of Maryland; M.H.A. 1959, University of Minnesota

Raymond George Hanken, *Professor Emeritus of Human Kinetics a Leisure Studies*
B.S. in P.E. 1938, M.A. in Ed. 1952, George Washington University

Ira Bowers Hansen, *Professor Emeritus of Zoology*
B.S. 1928, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Research Professor Emeritus of Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins U versity

Henry William Herzog, *Vice President and Treasurer Emeritus*
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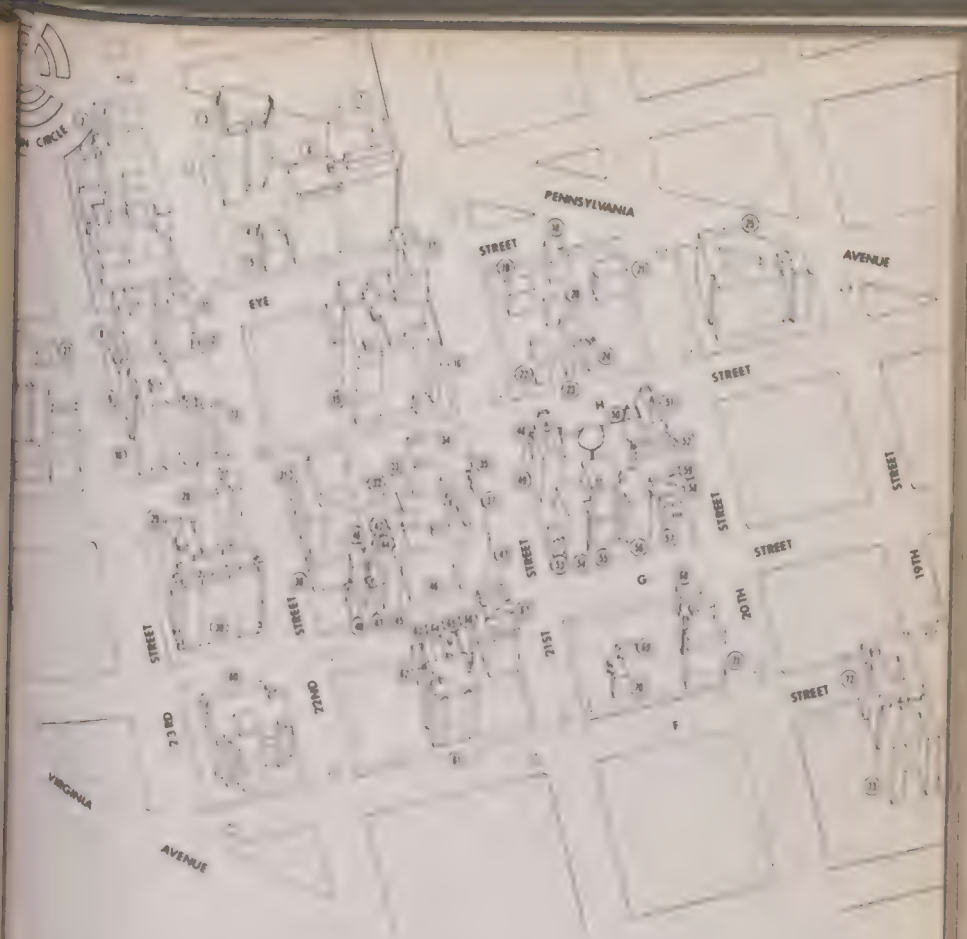
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Bldg T 2110 G St 64
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Bldg V 2114 H St (rear) 33
Bldg W 2024 26 G St (rear) 68

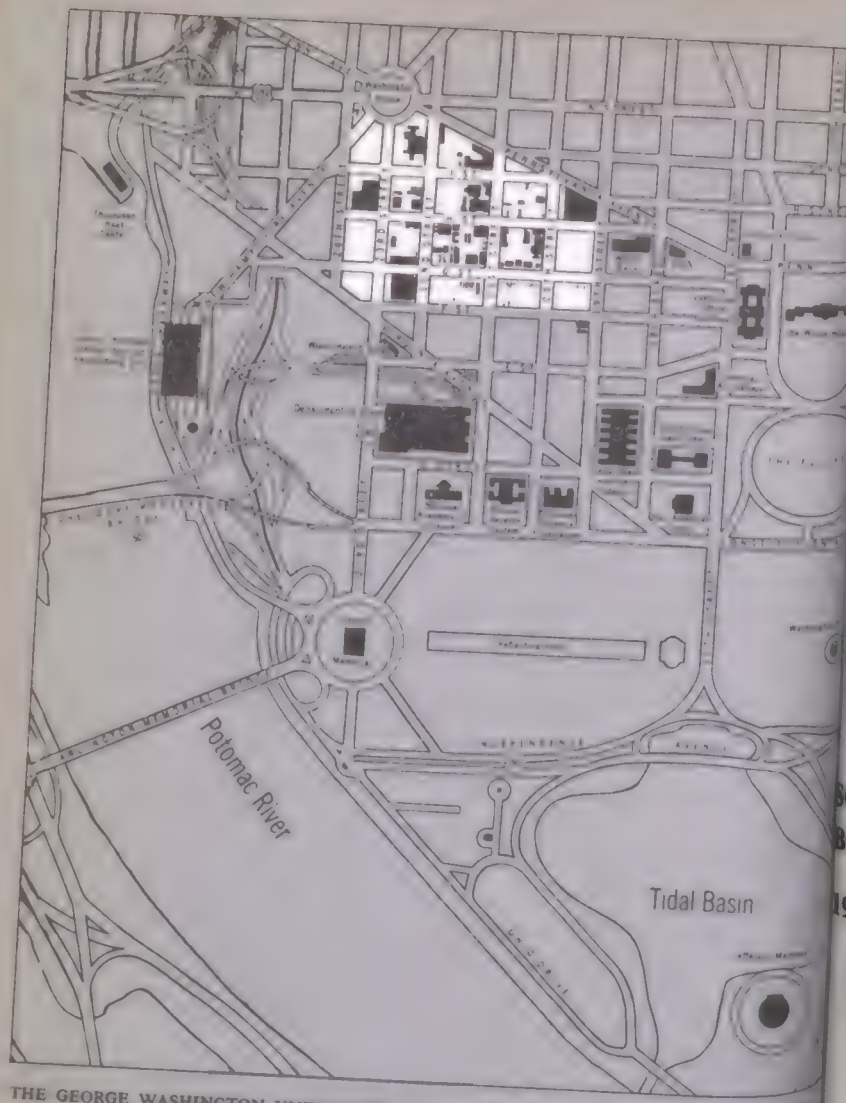
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Bldg EE 2129 33 Eye St (rear) 4
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Bldg GG 2125 G St 44
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Bldg NN 2025 H St (rear) 22
Bldg OO 815 21st St (rear) 18



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GEORGE WASHINGTON UNIVERSITY

HOOL OF MEDICINE AND HEALTH SCIENCES
LLETIN
-1981



THE GEORGE WASHINGTON UNIVERSITY CAMPUS / WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY
SCHOOL OF MEDICINE AND HEALTH SCIENCES BULLETIN
February, 1980

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CHOOL OF MEDICINE AND HEALTH SCIENCES
ULLETIN

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THE CALENDAR 1980–81*

AUGUST 1980

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SEPTEMBER 1980

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JUNE 1981

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JULY 1981

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August 27–29	Orientation, *Wednesday–Friday*
August 29	Registration, *Friday*
September 1	Labor Day—holiday for first- and second-year students, *Monday*
September 2	First day of classes, *Tuesday*
November 26	Thanksgiving vacation begins after classes for first- and second-year students, *Wednesday*
December 1	Return from vacation, *Monday*
December 19	Winter vacation begins after classes, *Friday*
January 5	Classes resume, *Monday*
January 8	Spring Registration, *Thursday*
February 16	Washington's Birthday—holiday for first- and second-year students, *Monday*
March 6	Spring break begins after classes for first- and second-year students, *Friday*
March 16	Return to classes, *Monday*
April 26	Spring break begins for third-year students at 5:00 p.m., *Sunday*
May 4	Third-year students begin clerkship, *Monday*
May 22	Last day of classes, *Friday*
May 25–29	Examination period, *Monday–Friday*
May 29	Commencement, *Friday*
August 23	End of third-year clerkships, *Sunday*

* This Calendar is subject to change. Although registration is conducted in both August and January, there is no precise date for the end of the fall semester; some courses end before the winter recess while others begin before the January registration.

THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion." During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period,

the buildings of the University were situated along H Street between Thirte and Fifteenth Streets.

During the last half century the University's present plant has been develo in that section of the old First Ward familiarly known as "Foggy Botto between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Ave Within a few blocks are the White House, the Department of the Interior, State Department, the World Bank, and many other governmental offices international agencies. The area has many reminders of historic interest to University. President Monroe, who signed the Charter, lived at 2017 Eye St The first President of the Board of Trustees, the Reverend Obadiah B. Bro was for 50 years the pastor of a church at Nineteenth and Eye Streets, Washington selected Twenty-third and E Streets as the site of the National U versity he had hoped to see established.

The University as it is now organized consists of Columbian College of A and Sciences (undergraduate); the Graduate School of Arts and Sciences; professional schools, which include the National Law Center and the scho of Medicine and Health Sciences, Engineering and Applied Science, Educa and Human Development, Government and Business Administration, and Pu lic and International Affairs; the College of General Studies; the Division University and Summer Students; and the Division of Experimental Progra

The George Washington University is privately endowed and is governed a self-perpetuating Board of Trustees of which the president is an *ex o* member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accredita agency, the Middle States Association of Colleges and Secondary Schools. T University is on the approved list of the American Association of Univers Women and is a member of the College Entrance Examination Board. T Department of Chemistry is on the approved list of the American Chemic Society.

The School of Medicine and Health Sciences has had continuous approval b the Council on Medical Education of the American Medical Association an the Association of American Medical Colleges. The Doctor of Medicine degre of the School of Medicine and Health Sciences is recognized by all state an territorial medical licensure boards in the United States.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on t basis of sex, race, color, religion, national origin, or handicap in any of its ed cation programs or activities. Federal regulations implementing Title IX of th Education Amendments of 1972 and Section 504 of the Rehabilitation Act o 1973 call for an explicit statement that the requirement not to discriminate o the basis of sex or handicap extends to employment in and admission to stud programs and activities. The University is also subject to the District of Colum bia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office for Civil Rights of the Department of Health, Education, and Welfare.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the academic departments, and other student and faculty organizations.

The Center Governing Board, representative of all elements of the University community, plays an important role in the day-to-day functioning of the center. This board works closely with the full-time staff in the development of procedures and policies which provide a framework for the center's operation.

RECREATION

The nation's capital provides abundant recreational resources, a large number of which are available at little or no cost. There are numerous art galleries, museums, concert halls, theaters, swimming pools, parks, and places of great historic interest. Social activities are provided by student organizations of the University, the School of Medicine and Health Sciences, and University-sponsored programs such as intramural sports, concerts, recitals, and dramatic productions. Religious faiths are well-represented in the Washington metropolitan area. Washington is one of the most colorful cultural and scientific centers of the world.

THE BOARD OF TRUSTEES OF THE UNIVERSITY

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John J. Wilson, LL.B., LL.D.
Watson W. Wise, Ph.B., Litt.D.

* Alumni trustee.

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Harold Frederick Bright, Ph.D., *Provost and Vice President for Academic Affairs*
Seymour Alpert, B.A., M.D., *Vice President for Development*
Carl James Lange, Ph.D., *Vice President for Administration and Research*
Charles Edward Diehl, B.Arch.Engr., B.C.E., M.B.A., *Vice President and Treasurer*
Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs and Executive Dean of the Medical Center*
Louis Harkey Mayo, B.S., J.D., *Vice President for Policy Studies and Special Projects*
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William David Johnson, B.S., *Director of Planning and Budgeting*
Frederick Justin Naramore, B.S., C.P.A., *Comptroller*
Joseph Young Ruth, B.A., *Director of Admissions*
Robert Gebhardtsbauer, M.A., *Registrar*



THE SCHOOL OF MEDICINE AND HEALTH SCIENCES

OFFICERS OF ADMINISTRATION OF THE MEDICAL CENTER

Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs and E*
ecutive Dean of the Medical Center

Office of Academic Affairs

The Office of Academic Affairs bears the responsibility for the curriculum; st
dent affairs, including scholarship and financial aid; research and sponsore
programs; allied health programs; educational evaluation; admissions; and sup
port services of the library and audio-visual and animal facilities.

Lawrence Thompson Bowles, M.D., Ph.D., *Dean for Academic Affairs*
Fred Leonard, Ph.D., *Associate Dean for Research*
Robert Keimowitz, M.S., M.D., *Associate Dean for Student Affairs and Admissions*
Winfield Harker Scott, Ph.D., *Associate Dean for Education and Director o Education*

Office of Administrative Affairs

The Office of Administrative Affairs is responsible for the administration of the University Hospital and Clinic, for support services to the School of Medicine and Health Sciences, and for the financial management of the Medical Center

Philip Stanley Birnbaum, M.S. in M.E., B.C.E., *Dean for Administrative Affairs*
Thomas James Carroll, B.A., *Director of Financial Services*
Bruce Johnson Dietz, B.A., M.S., *Director of Management Information*

Office of Clinical Affairs

The Office of Clinical Affairs is responsible for the patient care activities of the University Hospital and Clinic and for the supervision of the graduate and continuing medical education programs and community affiliation programs.

Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs*
Sheila McCarthy, B.S.N., *Director of Nursing*
Robert James Van Houten, B.S., M.D., *Associate Dean for Graduate and Continuing Medical Education*



HISTORY

The School of Medicine and Health Sciences of George Washington University has a distinguished history that goes back more than a century. In March, 1825, the School opened with the intention of building "a medical school commensurate with the progress and demands of a rising metropolis, and the improvement of service throughout the country." The School, the eleventh oldest medical school in the country, has met this responsibility by providing its students with a foundation in the medical sciences upon which they have built medical careers in practice, teaching, research, or administration.

In 1844 the School took on a new dimension when Congress granted it the use of the Washington Infirmary. Thus one of the earliest general teaching hospitals in the nation was established in Washington.

The distinguished history of the George Washington University School of Medicine and Health Sciences closely parallels academic advances and medical progress of the nation. The School has contributed to both.

The George Washington University Medical Center, established in 1966, consists of Walter G. Ross Hall, which houses the School of Medicine and Health Sciences; the Paul Himmelfarb Health Sciences Library; the University Hospital; the H.B. Burns Memorial Building, which houses the Medical Faculty Associates (the University Clinic); the Helen L. and Mary E. Warwick Memorial Building; and affiliated hospitals.

In 1973, with the introduction of undergraduate programs in Allied Health Sciences, the name of the School was officially changed from the School of Medicine to the School of Medicine and Health Sciences.

Regulations

A student enrolled in the University is required to conform to the foll regulations and to comply with the rules and regulations of the college, s or division in which he or she is registered.

A student who withdraws or is suspended, or is otherwise absent fro University for one semester or more, may re-enter and continue scholastic only under the regulations and requirements in force at the time of return

If a student knowingly makes a false statement or conceals material i mation on an application for admission, registration card, or any other Un sity document, the student's registration may be cancelled. If such falsific is discovered after the student has established an academic record at the versity, the student may be subject to dismissal from the University. Su student will be ineligible (except by special action of the Faculty) for s quent registration in the University.

Academic Dishonesty

The University community, to fulfill its purposes, must establish and m tain guidelines of academic behavior. All members of the community are pected to exhibit honesty and competence in their academic work. Incom students have a special responsibility to acquaint themselves with, and make of, all proper procedures for doing research, writing papers, and taking exa nations.

Members of the community will be presumed to be familiar with the pro academic procedures and are held responsible for applying them. Deliber failure to act in accordance with such procedures will be considered acade dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual fense against the community and will be prosecuted through the proper u versity channels.

Copies of the University policy on academic dishonesty can be obtained fro the following offices: all department chairmen, all academic deans, and t Vice President for Academic Affairs.

University Policy on the Release of Student Information

The Family Educational Rights and Privacy Act of 1974 applies to institution policies governing access to and release of student education records maintain by educational institutions which are recipients of Federal funds. The Univer sity complies with this statute, which states, in part, that such institutions mus

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records a inaccurate, misleading, or otherwise inappropriate; and
3. receive the student's written consent before releasing information fro his or her education records to persons outside the University, except fo directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certifica tion of the student's financial dependency; and

4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

Right to Dismiss Students

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

Right to Change Rules

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules and fees. Such regulations shall go into force whenever the proper authorities may determine.

Right to Make Changes in Programs

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

Student Conduct

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

University Policy on Drugs

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members

of the academic community should know that administrative action, may include dismissal from the residence halls, revocation of other priv or suspension or dismissal from the University, may be taken in order t tect the interests of the University and the rights of others.

The Libraries

Students have the privilege of using the University Library and the Sch Medicine and Health Sciences Library. The stacks are open, and all stu are welcome to browse at their leisure. A card denoting approved enrol for the current semester must be presented when books are borrowed fo side use.

All students using the libraries are expected to be familiar with the re tions governing their use, which are available at each library.

Property Responsibility

The University is not responsible for the loss of personal property. A "Lost Found" Office is maintained on campus in the Safety and Security Office.

Student Affairs

The Office of the Vice President for Student Affairs develops student life p grams, policies, and procedures to complement the University's formal instr tion program. These activities are implemented through the offices of t Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educatio Opportunity Program, Housing, International Students, Student Activities, St dent and Alumni Career Services and Student Health Service. More detail information on these and other activities is contained in the *Student Handbo*

Student Health Service

The Student Health Service is an outpatient clinic located in the H. B. Bur Memorial Building at 935 22nd St., N.W.

The Health Service is staffed by physicians, nurse practitioners, and phy sician's assistants who are capable of addressing most of student's medical prob lems. Visits are cost-free and may be either arranged by appointment or, durin certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in the College of General Studies and Continuing Engineering Education Program are not eligi

ble. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service has arranged for and endorsed group health and accident insurance, on an elective basis, for those full-time students who do not have other coverage. Students are encouraged to carry adequate health insurance coverage for themselves and, if married, for their spouses and children. Interested students should contact the Student Health Service Office.

Residence Halls

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing may be obtained at this Office and at the Office of the Dean for Academic Affairs. Reservations for private housing must be made by students.

Munson Hall Apartments

Munson Hall is a University owned and operated apartment house containing 15 one-bedroom and 54 efficiency apartments. Graduate and married students are eligible to reside in Munson Hall. Those wishing to apply for an apartment should contact the Housing Office for a waiting list application. All leases are for 12 months.

Milton and Guthridge Apartments

These apartment houses are University owned, commercially operated buildings within the campus area. Each building contains efficiency and one-bedroom units which are rented only to full-time graduate students on an "as available" basis. Referrals to the resident managers of these buildings are made by the Director of Housing when notice is received of vacancies. Leases are executed with the respective management companies and are on a month-to-month basis.

Housing for Undergraduate Allied Health Students

Admission to the University does not include a room reservation. The student will receive, with notification of acceptance, University residence hall information, an application for residence hall space and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, September to May, and lease payment must be made in June for the fall semester. Physician assistant and nurse practitioner applicants are not encouraged to apply for University housing in view of their extended academic year.

1980–81 RESIDENCE HALL RATES PER PERSON FOR TWO SEMESTERS

For Men:

Calhoun Hall
- double room .....
- triple room .....

For Women:

Strong Hall
- single room .....
- double room .....
- triple room .....

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—
- double room .....

Francis Scott Key Hall (limited to juniors and seniors)—
- apartment for two persons .....
- apartment for three persons .....1,524 or

Mitchell Hall (limited to sophomores, juniors, and seniors)—
- single room .....

Madison Hall
- double room .....
- triple room .....

Thurston Hall
- double room, triple room, room for four .....
- suite for six .....

FOOD SERVICE*

Resident allied health students in the freshman and sophomore years are required to choose one of the following three food service plans: the seven-day 19 meals per week plan, at the rate of $1,184* for the academic year; the a 14 meals per week plan for $1,106* for the academic year; or the any 10 meal per week plan at $1,054* for the academic year. Participation in the food service plan is optional for junior, senior and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

* Residence hall prices and allocation and food service prices are subject to change.

Veterans Benefits

The veterans counselor's office, on the third floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans, active duty personnel, or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., Washington, D.C. 20421.

Facilities

Walter G. Ross Hall

Walter G. Ross Hall was dedicated and opened in 1973. This modern facility provides the teaching and laboratory facilities for students in the School of Medicine and Health Sciences. It occupies a city block on the northwest edge of the University campus; its gross area is approximately 550,000 square feet, or more than 10 acres. The building is equipped with modern audiovisual and other teaching equipment as well as basic science laboratories.

Office of Education

The Office of Education comprises a group of core facilities and services supportive of the educational, clinical, and research missions of the Medical Center. Coordinated through the Associate Dean for Education, the four divisions of the Office of Education are the Office of Audiovisual Education, the Office of Academic Computer Services, the Division for Evaluational Services, and the Paul Himmelfarb Health Sciences Library.

The Office of Audiovisual Education and Services, Frank Allen, Ph.D., Director.—This office aims to enhance learning in the Medical Center with audiovisual technology. Consultation is provided in the use of nonprint media in educational, clinical and research programs. The office provides displays of audiovisual materials and programs in classrooms, in the Audiovisual Study Center of the Himmelfarb Library and throughout the Medical Center. It has highly developed production capabilities which are available to students and faculty. They include photographic, illustration, cinematographic and television studios, and a print shop which serve the Medical Center community. Virtually all learning spaces at the Medical Center are equipped for still and motion projection and television display. Those spaces subject to frequent use are equipped with permanent systems for projection, sound amplification and recording designed to support staff and student presentations.

Office of Academic Computer Services, F. Helmuth Orthner, Ph.D., D
tor.—This office provides training in computer literacy and delivery
computer-based learning materials. Other services include scoring of exam
tions, maintenance of academic records, computing in support of rese
projects, data acquisition, statistical analysis and text processing. The o
maintains hardware and software support for computer-based learning mate
developed by faculty and students of the Medical Center. It functions a
interface for the delivery of material from other computer-assisted educati
programs—notably Massachusetts General Hospital and Ohio State Univer
—through the Health Educational Network, Inc. Cooperative programs
the National Institutes of Health and the National Library of Medicine
vide access to additional computerized data bases.

Division for Evaluational Services, Winfield Scott, Ph.D., Director.—
primary task of this division is to work with faculty and students toward
improvement of educational programs. It provides consultation to faculty
support of efforts to maximize opportunities for learning. It conducts eval
tions of courses and other curriculum components and works toward
establishment of effective systems for evaluating student performance.

Paul Himmelfarb Health Sciences Library, Nina W. Matheson, Director
Located adjacent to Ross Hall, the Paul Himmelfarb Health Sciences Libr
provides 30,000 square feet to house a capacity of 80,000 volumes. Seat
is available to approximately 400 users. Space available includes smok
lounges, group study rooms, audiovisual viewing rooms, a typing room a
individual study carrels. The Audiovisual Study Center is equipped with



most recent and up-to-date resources and facilities, including videotape monitors, terminals for accessing computer-aided instructional programs, slide-tape recorders and rear-view slide projection units. The collection of more than 60,000 volumes and 1,400 journal subscriptions is enhanced by extensive nonprint audiovisual media which are both commercially and locally produced. Together these provide the foundation for the delivery of a number of special information services. The Network for Continuing Medical Education program provides loans of videotapes to individuals who cannot attend the regularly scheduled viewings. As a designated National Library of Medicine Medline Center, the library offers computer-based bibliographic research services such as Medline, Toxline and Cancerline. Staff may request monthly selective dissemination of information searches from this data base. Search capability on other data bases such as Science Citation Index, Psychological Abstracts and Biological Abstracts are being implemented. Materials not available in the collection will be borrowed to meet user needs.

Through both formal and informal means, the library staff instructs its clientele on the effective use of materials and services. An active participant in the National Library of Medicine's Regional Library Communications Network, the library is involved in regional planning and policy making.

The George Washington University Hospital

This 550-bed hospital, including the Eugene Meyer Pavilion and the Harry F. Duncan Pavilion, is adjacent to the School of Medicine and Health Sciences. It is the primary clinical teaching facility for the students and for a large house staff. It is fully approved and accredited by the American Medical Association, the American Hospital Association, the American College of Physicians, and the American College of Surgeons, through the Joint Commission for the Accreditation of Hospitals. Annual patient admissions number approximately 20,000.

The Watson Wise Emergency Pavilion of the hospital logs approximately 40,000 patient visits annually and is one of the city's most active emergency units.

The University Hospital is equipped to serve 16 specialty fields. Complex teamwork procedures such as renal dialysis, a computerized x-ray unit for diagnosing brain diseases, cardiac catheterization, open-heart surgery, transplant surgery, and total hip replacements are included in its activities. Facilities include a surgical suite of 10 rooms, two of which are equipped with overhead galleries where observers may communicate with the surgical teams, observe the electronic patient-monitoring system in action, and view the intricate surgical procedures below.

The Helen L. and Mary E. Warwick Memorial Building

This building houses a computerized multitest facility that is available to physicians for patient evaluation.

The Medical Faculty Associates (The University Clinic)

The Clinic is housed in the 13-story H.B. Burns Memorial Building, where ambulatory care is consolidated and integrated within the teaching program.

The academic group practice of physicians in general medicine and in m
than 20 specialties is based in the Burns Building. Visits of ambulatory
tients number approximately 90,000 annually.

Affiliated Hospitals

Children's Hospital National Medical Center.—Children's, one of the fir
pediatric health care centers in the country, houses 220 inpatient beds, includi
a specialized referral intensive care nursery and an adolescent unit. Its ambu
tory Diagnostic and Treatment Center handles in excess of 120,000 visit
year. Children's is the major base for the School of Medicine and Hea
Science's Department of Child Health and Development, and for the assign
pediatric clerkship. A variety of elective opportunities are offered in vario
aspects of child health.

Fairfax Hospital.—This 530-bed voluntary community teaching hospi
serves a burgeoning surburban area and provides all clinical services includi
psychiatry. Each year more than 20,600 patients are admitted, 4,900 babies d
livered, 15,000 surgical operations performed, and 49,200 persons examined an
treated in the Emergency Suite. Fairfax Hospital offers a rotating internsh
program, a School of Medical Technology, and clinical facilities for a School o
Practical Nursing. Students of the School of Medicine and Health Scienc
serve at this hospital in clinical clerkship and elective programs. Fairfax Ho
pital is an affiliated hospital for residency training in Obstetrics and Gynecolo
in the George Washington University Medical Center Program.

Holy Cross Hospital.—Holy Cross, a modern 338-bed hospital, is a primar
clinical campus which provides students with first-hand exposure to the practic
of medicine in the community. It is a private, voluntary facility in which th
full range of medical, surgical, and pediatric services are provided for a grow
ing suburban population. Last year, more than 19,000 patients were hospita
ized, nearly 47,000 emergency visits were registered, and 3,263 babies were de
livered at Holy Cross. The hospital, which has consistently experienced one o
the highest occupancy rates in the Washington metropolitan area, is planning an
expansion to include an additional 112 beds, enlarged emergency room facili
ties, and a new, self-contained center for in-and-out surgery.

National Naval Medical Center.—The Naval Hospital at the National Naval
Medical Center, Bethesda, Md., is a 750-bed general hospital offering a
wide range of specialized services, clinical research, and educational programs.
Medical care is provided to active duty and retired military members and their
dependents. It is a major referral center for thoracic and cardiovascular sur
gery as well as for cancer therapy. The teaching staff directs a complete intern
ship and residency program in 21 specialties.

St. Elizabeths Hospital.—St. Elizabeths Hospital, established by an act of
Congress in 1855, is a federal psychiatric hospital administered under the De
partment of Health, Education, and Welfare. This hospital provides for the
treatment, care, and general well-being of approximately 6,000 patients of
whom 3,400 are resident. The facility includes a completely approved General
Hospital to meet the needs for medical and surgical care and functions with a
full-time staff within the hospital plus attending physicians in various specialties.
The hospital maintains an up-to-date medical library.

Medical students of George Washington University utilize the facilities of
St. Elizabeths for clinical psychiatric training. Opportunities for research are

enhanced by a cooperative arrangement with the National Institute of Mental Health of the United States Public Health Service.

Veterans Administration Hospital.—In addition to the medical, surgical, psychiatric, neurological, tubercular, and physical medicine and rehabilitation services, this 700-bed hospital has a large outpatient program; an extensive medical research program; programs in open heart surgery, cobalt therapy, and renal dialysis; a metabolic program; and a specially designed Administrative Research Laboratory.

Washington Hospital Center.—This 843-bed private, voluntary institution serves the greater Washington area through a triad of activities: patient care, teaching, and research. The Center is the tenth busiest of more than 7,000 hospitals in the United States and the second busiest private hospital in terms of inpatient admissions. A very active emergency service cares for more than 49,000 patients a year, and the 50 clinics provide all major clinical service except pediatrics for about 65,400 outpatients and 31,700 inpatients yearly. In addition to an extensive approved internship and residency program, the Center offers organized instruction for nurses, laboratory and x-ray technicians, medical secretaries, and other health-related vocations.

Committees 1979–80

ACADEMIC FREEDOM AND ETHICS

R.A. Kenney *(Chairman)*, B. Arling, H.L. Feffer, H.C. Pierpont, R. Hugh, J.C. Straw, P.F. Teychenne

ADMISSIONS AND ADVANCED STANDING

M.F. Armaly *(Chairman)*, C.U. Battle, C.J. Bier, L.T. Bowles *(ex officio)*, J.H. Egan, J.B. Erdmann, P.L. Gross, R.I. Keimowitz, S.A. Levine, M. Marks *(2nd-year medical student)*, J. Sandler *(3rd-year medical student)*, G.V. Stokes, M.E. Tidball, B. Waxman

ALLIED HEALTH PROGRAMS

J.E. Ott *(Chairman)*, J.A. Becker, P.S. Birnbaum, L.T. Bowles *(ex officio)*, J.K. Johnson, T.N. Johnson, K.R. Katterjohn, P. Mazel, S. Silver, P.E. Shorb, Jr., S. Steinbrook *(Physician's Assistant Program Student)*, G.A. Walker, D.W. Watkins, J.M. Wise

APPOINTMENTS, PROMOTION AND TENURE

J.M. Wiener *(Chairman)*, L.F. Affronti, A. Breslow, D.O. Davis, H.L. Feffer, N.C. Kramer, W.P. McKelway

BYLAWS

M.L. Elgart *(Chairman)*, L. Cytryn, H.C. Pierpont *(ex officio)*, J.J. Rheingold, J.R. Shapiro, W.S. Yamamoto

COMMUNICATIONS AND EDUCATIONAL RESOURCES

D.S. Edge *(Chairman)*, F.D. Allan, L.T. Bowles *(ex officio)*, P.J. Cohen, M
Delaney, D.W. Dew, F.J. Kavanaugh, J.M. Kerns, R.A. Lavine, N.W. Ma
son, H.C. Miller, Jr., H.F. Orthner, W.H. Scott, M.J. Shaffer, L.W. Thompso

CONTINUING MEDICAL EDUCATION

B.S. Dunbar *(Chairman)*, E. Aleskow, F.D. Allan, H.H. Ammerman, A. B
J.K. Barber, N.Z. Einstein, C.T. Garrett, L.W. Greenberg, K.R. Katterjo
A.M. Mondzac, R.A. Nicklas, D.S. O'Leary *(ex officio)*, T.E. Piemme, C
Rogers, R.J. VanHouten, L.M. Weiss

EDUCATIONAL EVALUATION

J.C. Rios *(Chairman)*, L.F. Affronti, B.C. Blatt, L.T. Bowles *(ex officio)*, J. C
cillo *(2nd-year medical student)*, D.C.T. Choate, J. Farley *(3rd-year medi*
student), B.L. Frankel, B.J. Gaffney, B.E. Gilson, J.M. Giordano, A.L. Gr
stein, V.M. Iovine, M.J. Jackson, R.I. Keimowitz, S.M. Knoll, A.M. Kwa
J.W. Larsen, Jr., W.H. Scott, J.J. Rheingold, H. Sidransky, O.L. Silva, J.
Straw, C.W. Thompson, R.S. Wilkinson, A.C. Wyman

EDUCATIONAL PLANNING

A.M.S. Thompson *(Chairman)*, G.P. August, P.S. Birnbaum, L.T. Bowles *(ex*
officio) B. Buckley *(2nd-year medical student)*, I. Dosovitz, N.Z. Einstein, I.
Gallo, K.Y. Huang, R.J. Katz, R.M. Kaufman, R.I. Keimowitz, M.J. Koenig
A. Ladner *(3rd-year medical student)*, J.C. LaRosa, R.A. Lavine, H.G. Ma
del, F.N. Miller, Jr., G.F. Molinari, W.W. Olmsted, J.M. Orenstein, T.F
Piemme, P. Rogers *(4th-year medical student)*, W.H. Scott, J.G. Sites, C.T
Spiegel, H.H. Trout, III, B. Waxman, J.M. Wise

EXECUTIVE COMMITTEE OF THE MEDICAL CENTER FACULTY SENATE

R.A. Kenney *(Chairman)*, R.P. Kaufman *(ex officio)*, J.C. Rios, N.P. Trujillo
N.T. Tsangaris, J.M. Wiener

GRADUATE MEDICAL EDUCATION

S. Perlin *(Chairman)*, M.F. Armaly, P.L. Bisk, A.H. Einhorn, M.L. Elgart
R.M. Kaufman, R.I. Keimowitz, S.G. Kent, A.I. Kobrine, J.C. LaRosa, H.G
Mandel, F. Melograna, H.C. Miller, Jr., G.F. Molinari, R.J. Neviaser, D.S
O'Leary *(ex officio)*, W.W. Olmsted, L.G. Pawlson, W.H. Scott, P.E. Short
Jr., L.W. Thompson, R.J. VanHouten, B. Waxman

LONG RANGE PLANNING

A.B. Weingold *(Chairman)*, P.S. Birnbaum *(ex officio)*, L.T. Bowles *(ex officio)*
D.O. Davis, A.L. Goldstein, R.P. Kaufman *(ex officio)*, H.G. Mandel, D.S
O'Leary *(ex officio)*, J.C. Rios, A. Segal, H. Sidransky

EDICAL SCIENCES GRADUATE PROGRAMS

. Reich *(Chairman)*, L.T. Bowles *(ex officio)*, W.C. Eckelman, J.K. Kelleher, . Klubes, M.J. Koering, Y. Al-Doory, G.V. Vahouny

UBLIC RELATIONS

. Waters, Jr. *(Chairman)*, P.S. Birnbaum *(ex officio)*, M.P. Footer, R.N. Fuller, .J. Lewis, P. Mazel, G.B. Thurman

ESEARCH

.C. Kramer *(Chairman)*, B. Beebe *(3rd-year medical student)*, S. Bloom, L.T. owles *(ex officio)*, E.W. Bradley, M.M. Cassidy, G.W. Geelhoed, A.L. Goldtein, K.E. Johnson, P.D. Kind, J.C. LaRosa, D.S. Lee, F. Leonard, P. Mazel, .F. Molinari, S. Morgan *(3rd-year medical student)*, T.E. Morgan, H.F. Orther, R.K. Riegelman, A.M. Ross, S.J. Wolin

PACE AND FACILITIES

.W. Smith *(Chairman)*, F.P. Abramson, T.C. Alford, P.S. Birnbaum *(ex fficio)*, D.G. Borenstein, L.T. Bowles *(ex officio)*, J.B. Craft, Jr., W.C. Eckelman, C.T. Garrett, R.I. Keimowitz, P.D. Kind, F. Leonard, R.A. Muesing, .E.P. Oliveri, F.J. Slaby, G. Sprouse *(2nd-year medical student)*, D.W. atkins

TUDENT AFFAIRS

.C. Green *(Chairman)*, R.J. Anderson, L.T. Bowles *(ex officio)*, M.J. Chang, .C.T. Choate, W.H. Cooper, H.C. Harmon *(2nd-year medical student)*, F.K. arris, II, K.Y. Huang, D.J. Lynn, J.M. Pisani, R. Roberts *(4th-year medical tudent)*, W.H. Scott, C.J. Tidball, R.J. Walsh, T.G. Webster

Alumni and Allied Associations

THE GENERAL ALUMNI ASSOCIATION

he objectives of this association are to unite graduates who wish to associe themselves for charitable, educational, literary, and scientific purposes, and promote the general welfare of the University.

Eligible members are those who have matriculated in any school of the Uniersity and left the University in good standing, or any person who is or has een a member of the teaching, research, or administrative staff of the Univerity, or of the Board of Trustees of the University. Active members are those ligible members who are current contributors (dues or otherwise) to or life embers of the George Washington University General Alumni Association,

the Alumni Association of any school of the University, or contributors t Annual Support Program.

The Alumni Office is in Alumni House, 714 Twenty-first Street, N Washington, D.C. 20052. All alumni are urged to keep the Alumni Offic formed of changes of address or occupation and to supply information regard to their fellow alumni.

THE GEORGE WASHINGTON UNIVERSITY MEDICAL ALUMNI ASSOCIATION

The George Washington University Medical Alumni Association, incorpora in 1959, continues the organization previously known as the George Wash ton University Medical Society.

The stated purposes of the Association are as follows: "This shall be a n profit organization international in scope, whose objectives shall be to prov constructive services for the M.D. degree alumni of the George Washing University School of Medicine and Health Sciences for furthering the art science of medicine, research, and for the promotion of the welfare of George Washington University School of Medicine and Health Sciences, students, the George Washington University Hospital and its trainees."

Active membership in the Association consists of all M.D. degree gradua of the School of Medicine and Health Sciences; current members and, on ap cation, past members of the teaching staff of the School of Medicine and Hea Sciences, who hold doctoral degrees; doctors of medicine who have had or more years of postgraduate training in the George Washington Univers Hospital. Junior membership consists of all members of the student body the M.D. degree program of the School of Medicine and Health Sciences.

The Medical Alumni Association maintains an office in the School of Me cine and Health Sciences.

Officers for 1979–80

President—Dee Parkinson, M.D. 1963
President Elect—Sidney Levine, M.D. 1941
First Vice President —William Cooper, M.D. 1949
Second Vice President—Harry C. Beaver, M.D. 1963
Secretary—William Thompson, M.D. 1967
Treasurer—John Lyles, M.D. 1970

Council:

Brooks Brown III, M.D. 1969
Marvin Footer, M.D. 1942
John Mermel, M.D. 1960
Milton Milne, M.D. 1964
Alvin Parrish, M.D. 1945
Julius Piver, M.D. 1952
William Schewe, M.D. 1943
Barbara Sherwin, M.D. 1967
Robert K. Wineland, M.D. 1951
Paul Zimmons, M.D. 1967

THE DOCTOR OF MEDICINE DEGREE PROGRAM

ADMISSION

The George Washington University School of Medicine and Health Scie seeks to enroll intellectually gifted, humanly sensitive, mature persons who excel in the science and art of medicine. Applicants of diverse social and cational backgrounds have access to the admissions process. In the selec process there is no discrimination because of sex, race, color, religion, marital status, national or regional origin, or handicap.

Entrance Requirements

ADMISSION TO THE FIRST-YEAR CLASS

For admission to the Doctor of Medicine degree program, a minimum semester hours must have been earned in an accredited American or Canad institution of higher learning. Credits earned in a professional school can applied to the fulfillment of this minimum requirement only if they are acce able by the applicant's college or university toward a bachelor's degree in or science. (A credit under the quarter system is two-thirds of a semester hou It is advantageous to complete four full years of undergraduate study. Only ceptional students are accepted upon completion of the minimal requiremen

It is possible for exceptional students with three years of undergraduate wo in Columbian College of George Washington University to be admitted to t medical school and to receive a combined Bachelor of Arts-Doctor of Medic degree. More detailed information on this program is given on page 31.

The following courses must be completed with satisfactory achievement b fore the applicant can be certified for matriculation. All required scienc courses must include sufficient laboratory work to give assurance of familiarit with the experimental methods and techniques of the disciplines.

1. **Biology:** Eight semester hours, including two semester hours of labora tory. This may be either in general biology or zoology, but may *not* include separately credited courses in botany.

2. **Chemistry:** Eight semester hours of general inorganic chemistry (which may include qualitative analysis), including two semester hours of laboratory six to eight semester hours of organic chemistry, including laboratory.

3. **Physics:** Eight semester hours, including at least two semester hours of laboratory.

4. **English:** Six semester hours in composition and literature. This may be the usual introductory college course or its equivalent.

The number of required courses has been kept to a minimum in order to allow college students the time to pursue their own interests in depth. The Admissions Committee has no preference with regard to the major area of study of the applicant. Students with backgrounds in the arts, humanities, and social sciences are as admissible as applicants with science backgrounds. The Committee does expect that work in the student's chosen area of concentration as well as in the required science courses should reflect scholarly interests and show evidence of significant achievement.

ADMISSION WITH ADVANCED STANDING

A number of recent developments require further deliberation by the Faculty before an appropriately revised policy on advanced standing can be articulated. At the time of printing of this *Bulletin*, this review was not complete. Interested applicants are invited to write to the Office of Admissions of the School of Medicine and Health Sciences for final regulations.

Application Procedure

APPLICATION TO THE FIRST-YEAR CLASS

Application forms are available from the Office of Admissions. All applicants are reminded that the submission of materially false or misleading information in application forms or in connection with the application process shall be grounds for rejection. If such submission is discovered after entrance into the School or award of a degree, it shall be grounds for dismissal or for revocation of the degree.

The School is a participant in the American Medical College Application Service (AMCAS). Applications for a place in the first-year class can be obtained only from AMCAS, 1776 Massachusetts Avenue, N.W., Suite 301, Washington, D.C. 20036. When completed, this application is returned to AMCAS for distribution to schools selected by the applicant. The AMCAS application deadline is November 1 of the year preceding that for which admission is sought.

After receipt of our copy of the AMCAS application, the Office of Admissions will send applicants a Supplemental Application. This requests information not included on the AMCAS application. Submission of this supplemental application (due no later than December 15), including the nonrefundable supplemental application fee ($30), will initiate Admissions Committee processing of the application. On the basis of available information some applicants will be asked to have letters of evaluation (recommendation) sent. After careful review of these documents the committee will extend an invitation for interview to the most promising candidates. When these steps are completed, the application will be brought to the Admissions Committee for final decision. Applicants will be informed of final decisions immediately. Although it does not assume an obligation to report missing or erroneous credentials, the Admissions Office will try to contact the applicant if it is noted that necessary credentials are missing.

This institution also participates in the AMCAS Early Decision Program. Interested applicants are referred to the AMCAS Information Booklet included with the AMCAS application materials. Early decision applicants should be aware that they must submit their application by August of the year preceding that for which admission is sought, and that for consideration, the supplemental application and all letters of recommendation and transcripts must be received by the Office of Admissions no later than September 1. Decisions on early decision candidates are made usually by October 1 and no later than October 15.

Applicants are referred to the AMCAS information booklet and to the admissions brochure available from the Office of Admissions, School of Medicine and Health Sciences, for the most up-to-date information available at the time of application. Details included in those sources supersede information contained herein.

APPLICATION WITH ADVANCED STANDING

Information and applications for admission with advanced standing should be obtained from the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, 2300 Eye Street, N.W., Washington, D.C. 20037.

All applicants must complete an advanced standing application form and submit it with a $30 application fee no later than June 1.

Selection Procedures

To process the vast number of applications to this institution fairly and expeditiously, a screening evaluation system is utilized. This evaluation procedure screens applicants on the basis of undergraduate grades (taking into account improvement in performance in later years), Medical College Admission Test scores, and pertinent extracurricular and work experiences. Some additional consideration is given to applicants from the District of Columbia and the neighboring metropolitan area, as well as to applicants from George Washington University. There are no age limits.

When all credentials and interview reports are available, the application is reviewed by the Admissions Committee. In this review, although grades and MCAT scores are considered, major consideration is given to the essay portions of the applications, the letters of evaluation, and the interview reports, in an attempt to assess those motivational and personal characteristics that the committee feels are important in choosing future physicians.

Applicants who are offered a place in the class are required, within two weeks, to notify the Office of Admissions (M.D. Program), School of Medicine and Health Sciences, in writing, of their intent to accept the places reserved for them. A deposit of $100 is also required by a specific date after notification of acceptance. The date will be given in the notice of acceptance. The deposit becomes nonrefundable two weeks prior to registration but will be credited toward the first semester's tuition.

PROGRAM OF STUDY

The faculty and administration of the School of Medicine and Health Sciences have developed a curriculum designed to prepare each student for

ofessional life of continuous learning. Because students differ in background, lity, and career interests, the curriculum is balanced with required courses, d students are encouraged to maximize achievement within their own limits. is presumed that all graduates will seek additional education in graduate ining programs before assuming complete responsibility for independent nical decision-making.

In the first year, the student concentrates primarily on basic sciences. The urse of study includes anatomy and biochemestry in the first semester. In e second semester, the student concentrates on physiology and microbiology addition to an integrated course in neurobiology.

Freshman and sophomore medical students are permitted to register for ectives for credit or use elective time at their discretion. The first two weeks an elective are probationary, to enable students to decide whether it is ited to their needs. After completing the first two weeks of an elective, udents are committed to complete the course requirements.

The second year integrates basic science and clinical information. Path- ogy and pharmacology provide the major basic science substrates. This ademic program has been evolving since 1970 and several innovations have en introduced each year. The course is coordinated by a program director. tegration is accomplished through the work of faculty subcommittees work- g with the program director and the second-year subcommittee on educa- onal planning. Medical students are introduced to physical diagnosis during e first semester of the second year.

The final two years form a two-year continuum of required clerkships and ective sequences, designed to bring the student to optimal readiness for aduate training. Clerkships are required in medicine, surgery, pediatrics, stetrics-gynecology, psychiatry, and health care sciences. Each student must



complete a 4-week acting internship in one of the following: medicine, pediatrics, or family medicine. In addition, each student must take a 2-week clerkship in anesthesia and *two* 2-week clerkships from among the following: orthopaedics, urology, neurosurgery, or plastic surgery.

A variety of elective experience is available at the University and its affiliated hospitals; permission may be granted to take electives elsewhere.

During the entire educational experience, students are encouraged to assume responsibility for their self-assessment and continued learning. It is the goal of the faculty to select and educate concerned human beings who will function productively and effectively during a long career in medicine.

DEGREE REQUIREMENTS

Every candidate for graduation with the degree of Doctor of Medicine must have satisfactorily completed the requirements of the School of Medicine and Health Sciences as described above, including no less than four academic years of study as a matriculated student in medicine or the equivalent. All required courses must be completed and all prescribed examinations satisfactorily passed.

HONORS

Candidates who have completed the four-year course for the Doctor of Medicine degree and have received the grade of *H* (Honors) in courses totalling 50 per cent or more of the total number of semester hours taken may be recommended by the Executive Committee of the Medical Center for graduation "With Distinction."

COMBINED DEGREE PROGRAMS

Combined Bachelor of Arts and Doctor of Medicine

To be recommended for the degree of Bachelor of Arts, the candidate must complete at least 94 semester hours of prescribed college work (at least 30 hours and one year of residence must be completed in Columbian College of Arts and Sciences) and the first year of the medical curriculum. Upon satisfactory completion of the fourth year of the medical curriculum the student becomes eligible for the degree of Doctor of Medicine.

It should be understood, however, that admission to Columbian College does not guarantee admission to the School of Medicine and Health Sciences.

Combined Master of Science and Doctor of Medicine

The departments of the School of Medicine and Health Sciences cooperate with the Graduate School of Arts and Sciences in offering programs leading to the combined degrees of Master of Science and Doctor of Medicine in the fields of biochemistry, genetics, microbiology, mycology, pharmacology, and physiology.

Students in the School of Medicine and Health Sciences who wish to apply for the combined degrees of Master of Science and Doctor of Medicine must meet

the requirements for admission to the Graduate School of Arts and Sciences. They must be recommended by the chairman of the department and by the Dean of the Graduate School of Arts and Sciences and the Dean for Academic Affairs of the Medical Center.

The Master of Science degree program consists of a minimum of 30 semester hours which includes a thesis (equivalent to six semester hours). For a Master of Science degree program which does *not* include a thesis, the number of semester hours of graduate course work is determined by the department. The program without the thesis is not an individual student option and is not available in every department.

A maximum of 12 semester hours of credit for graduate-level courses *completed as a part of the Doctor of Medicine degree* (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining semester hours of work, including a thesis if it is required, must be in course work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

In cooperation with the Graduate School of Arts and Sciences a dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements which must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

To enter the dual degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the dual degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a *departmental* doctoral committee and is available in more than 50 research fields.

A student working toward these degrees may apply a maximum of 24 semester hours of approved work taken in the M.D. degree program of the School of Medicine and Health Sciences toward the total of 72 semester hours required to complete the requirements for the Doctor of Philosophy degree. Twenty-four hours of this requirement must be earned in graduate courses during periods when the student is not obligated to full-time enrollment in the M.D. degree program, i.e., during summer sessions, vacation periods, etc. The final 24 semester hours of dissertation research toward the Doctor of Philosophy degree may begin concurrently with the final semester of graduate course work. The estimated time for completion of this dual program is six years.

Master of Science and Doctor of Philosophy Requirements

The detailed requirements for the degrees of Master of Science and Doctor of Philosophy are stated in the *Undergraduate and Graduate Bulletin* of the University, which is available at the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

REGULATIONS FOR M.D. CANDIDATES

Attendance

A student is not permitted to attend classes until registration has been com pleted and fees due have been paid. Regular attendance is required.

Grades

H (Honors); *P* (Pass); *F* (Fail); *CN* (Conditional); *IP* (In Progress); *I* (In complete); *W* (Withdrawal).

H (Honors).—Those students whose performance in a subject as determined by the department concerned is of a very high caliber, and who, *in addition* have demonstrated those qualities of intellectual curiosity, integrity, and self discipline which clearly set them apart from the majority of the group, may be assigned the grade of *H* (Honors).

P (Pass).—All students, with the exception of those specifically defined above, whose performance in a subject meets the minimum requirements established by the department concerned, shall be assigned a grade of *P* (Pass).

F (Fail).—Those students whose performance in a subject as determined by the department concerned is of such a low caliber that a satisfactory level of performance could not reasonably be expected to be attained by a program of guided study developed by the department shall be given a grade of *F* (Fail).

A grade of *F* requires that the student repeat the course at this or some other institution approved by the department and the Dean for Academic Affairs prior to proceeding to the work of the following year. Upon completion of such a course with a grade of *P* (Pass) or its equivalent, the student shall be permitted to continue in the M.D. program and the grade of *F* converted to *F/P*.

CN (Conditional).—Those students who do not meet the minimum requirements established by the department concerned but who could reasonably be expected to do so through a program of remedial work to be developed by the department and approved by the Committee on Educational Evaluation shall be assigned the grade of *CN* (Conditional). The grade of *CN* is not a passing grade and must be upgraded prior to beginning the next academic year or, in the case of clinical subjects, prior to graduation. Upon certification by the department that the student has attained suitable proficiency in the subject, as evidenced by examination or such other criteria as may be appropriate, the student shall be permitted to continue in the M.D. program and the grade of *CN* converted to *CN/P*.

A student may, in lieu of such a program, elect to repeat the course at this or any other institution which is approved by the department concerned. A grade of *P* (Pass) or better shall then result in conversion of the *CN* to *CN/P*.

Failure to upgrade a *CN* to *CN/P* by one of these procedures within the prescribed period shall result in the automatic conversion of the *CN* to *CN/F*.

IP (In Progress).—The grade of *IP* will be assigned to students in courses which require more than one semester for completion. A grade will be assigned upon completion of the entire course in a subsequent semester.

Incomplete).—The grade of *I* will be assigned when a student fails to complete all the required work in a course for reasons acceptable to the Dean for Academic Affairs. A student in the first or second year may not proceed into the work of the following year until a grade of *I* has been removed; if not removed, a grade of *I* will be changed automatically to a grade of *F* (Fail) after one year. A student in the third or fourth year must remove a grade of *I* prior to graduation.

(Withdrawal).—The grade of *W* will be assigned only when a student is unable to continue in school for reasons acceptable to the Dean for Academic Affairs. Such reasons may *not* include scholarship. The student may be readmitted at the discretion of the Dean for Academic Affairs, within a period of two years, and may repeat for credit the course or courses in which the grade of *W* had been assigned.

Grading of First- and Second-Year Electives

The first two weeks of an elective in the first and second year are probationary to enable students to decide whether it is suited to their needs. After completing the first two weeks of an elective, the student is committed to complete the course requirements and each elective shall be graded on a Pass/Fail system with the grade *P* or *F* recorded on the student's transcript. Distinguished performance should be recognized by sending a letter to the Dean for incorporation into the student's file.

Definition of Good Academic Standing

A student is considered in good academic standing until such time that he or she is formally dismissed from the Doctor of Medicine degree program. In other words, for those programs that require a statement of good academic standing from the institution, such a statement will be forthcoming on any student unless he or she is formally dismissed from the Doctor of Medicine degree program of the School of Medicine and Health Sciences.

Academic Probation and Academic Dismissal

On recommendation of the Educational Evaluation Committee, the Dean for Academic Affairs may place a student on academic probation or dismiss him or her from the M.D. program. The Educational Evaluation Committee shall make its recommendations after careful and individual review considering the total number of credit hours of *CN* and *F* grades in required courses and required elective courses attained by the student during the M.D. program, without regard to whether these grades have been upgraded by further study; except that in the case of a student who has been permitted to repeat a year, the initial grades will not be included in this total.

Academic probation and academic dismissal may be recommended by the Educational Evaluation Committee under the conditions described below.

Academic Probation.—A student who receives grades of *F* in courses totaling six or more semester hours, or a combination of grades of *F* and *CN* in more than six semester hours in one semester, shall be placed on academic probation for the following semester. A student who, while on probation, re-

ceives a grade of *F* or *CN* in any course will be continued on probation f
the following semester. A student who, through action of the Educationa
Evaluation Committee and the Dean for Academic Affairs, has been p
mitted to repeat a year shall be placed on academic probation. All studen
on academic probation shall be reviewed by the Educational Evaluation Com
mittee at the end of their probational periods.

Academic Dismissal.—A student (1) who is on academic probation for fo
or more semesters, consecutive or otherwise; or (2) who receives grades of
in courses totalling 14 or more semester hours in any academic year; or (
who receives grades of *CN* or *CN* and *F* combined in courses totalling mo
than 20 semester hours of work in any academic year; or (4) who receiv
grades of *F* in more than 20 semester hours of work in the M.D. progra
or (5) who receives grades of *CN* or *CN* and *F* combined totalling more th
30 semester hours of work in the M.D. program; or (6) whose knowledge a
clinical competencies have not achieved, in the judgment of the Educationa
Evaluation Committee, a satisfactory level of development and integration
any stage of training to justify continuing him or her as a reasonable can
date for the M.D. degree will be subject to dismissal from the M.D. degr
program. (See also section on Evaluation of Non-Academic Competence.)

Evaluation of Non-Academic Competence

To assure the safety of the public, the institution reserves the right to dism
from the M.D. program any student whose behavior is clearly unacceptab
for or would be dangerous in the practice of medicine. Since it would be
possible to catalogue all behaviors which might raise serious question as to
student's competence to continue in medical school, a process has been est
lished to deal with problems in this domain. Safeguards have been taken to p
vent this from becoming a mechanism to discourage deviation from so
norms, or to suppress personal or political expression. It is carefully desig
to protect any student from discrimination on the basis of his or her bel
or personal behavior where these are not likely to be dangerous to the pu
should the student become a physician.

Upon receipt of a written complaint about a student, the Dean for Stud
Affairs would inform the student and conduct a confidential inquiry. Poss
dispositions would be to advise the student, to drop the matter entirely, o
refer it on to a subcommittee of the Educational Evaluation Committee.
of the subcommittee's four members would be medical students. The
committee's proceedings would also be confidential, and would result in a
ing the student, dropping the matter or referring it on to the Educati
Evaluation Committee. Its recommendations might be to discontinue the
quiry, to place the student on probationary status (which would be
fully defined), or to dismiss the student from the M.D. program. At
stage, the student would have the right of appeal.

Any interested person may receive a copy of the complete regulations
students in the M.D. program from the Admissions Office or from the O
of the Dean for Academic Affairs.

xaminations

xaminations, which may be written, oral, or practical, will be held during nd/or at the end of each semester.

raduation

raduation follows satisfactory completion of the course of study, and does ot imply the acquisition of a set number of credit hours.

Application for Graduation.—Application for graduation must be filed in the ffice of the Dean for Academic Affairs, and the fee must be paid at the time f registration for the last semester of the fourth year.

Presence at Graduation.—A candidate is required to be present at the gradua- on exercises unless written application for graduation *in absentia* is approved y the Dean for Academic Affairs.

EES AND FINANCIAL REGULATIONS FOR M.D. CANDIDATES

he following fees have been established for the 1980–81 academic year.*

pplication fee	$30.00
ition fee, for the academic year for 1st-, 2nd-, and 3rd-year medical students	11,800.00
ition fee, for the academic year for 4th-year medical students	9,600.00
iversity Center fee, charged all students (except those granted "leave of absence" status) each semester	50.50
ate registration fee, for failure to register within the designated period	15.00
ate payment fee, charged for failure to make payments when due (see "Payment of Fees," below)	15.00
inancial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below)	35.00
raduation fee	25.00
eturned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for insufficient funds or for any other reason	15.00
ranscript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	.50
eplacement of lost or stolen picture identification card	2.00

nergy Surcharge—Because the price of fuel oil has risen out of proportion to the jected increase of tuition fees, and because this price is anticipated to rise even ther in 1980-81 by an indeterminate amount, an energy surcharge will be as- sed at the time of registration. The amount of this surcharge will be determined nd announced prior to July 1, 1980.

ayment of Fees

The annual fee for the 1980–81 academic year is payable in two equal install- ments on or before registration day for each semester. M.D. students who regis- er during the summer for courses offered in other divisions of the University will be charged the regular summer tuition and other fees. No tuition will be

*For courses offered in other divisions of the University, the following 1980 Summer Sessions fees apply for each semester hour: Tuition $117.00; University Center fee, $4.75.

charged M.D. students for Medical School clerkships elected by the stude during the summer between the second and third years. No additional tuitio will be charged third year students for courses taken anywhere in the Univer sity during the summer prior to registration as a fourth year student. No st dent is permitted to complete registration or attend classes until all charges a paid. Tuition and fees are payable at the Office of the Cashier of the Univer sity. Checks should be made payable to George Washington University, w student indentification number shown in upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintainin student accounts for tuition, various fees, and room and board charges. Whe tuition is due and payable in full as described above, students may sign deferred payment contract with the Student Accounts Office at the time registration permitting them to pay one-half of the total tuition and fees (e cept for fees payable in advance) at the time of registration and the remainin half on or before October 22, 1980 (for the fall semester), and March 1981 (for the spring semester). Interest at the rate of eight per cent per annu on the unpaid balance will be charged from the date of registration to the da payment is made.

Students receiving tuition assistance in the form of scholarships, govern ment tuition contracts, or other forms of tuition awards are not permitted t sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $1,500 or more per semester. Under such circumstances the student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance b signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late payment fee and will be subject to the interest charge o eight per cent per annum. Accounts which become 30 days past due will b financially encumbered. In the event a student's account is financially encum bered, the student forfeits rights to the use of the deferred payment contract in future semesters, and the Student Accounts Office will notify the Registrar t withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settle ment will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

After entering the course of instruction the student is obligated for the tuition for the full semester. A student registered for medical electives in the summer session between the second and third year is obligated for tuition due at the time of registration for the following fall semester, except that in the case of withdrawal or leave of absence a *pro rata* payment will become due immediately.

Acceptance by the University of a student's fees does not in any way obli gate the School of Medicine and Health Sciences to accept the student for a subsequent semester or summer session, and the right is reserved to require the withdrawal of any student whenever, in the interest of the student or the School the Executive Committee of the Medical Center deems it advisable to do so.

Cost of Textbooks and Student Equipment

The minimum cost of necessary textbooks and student equipment (microscope drawing materials, glass slides, clinical thermometer, stethoscope, hemocytom eter, uniforms, etc.) is approximately as follows: first year, $700; second year

$900; third year, $250; and fourth year, $150. Microscopes must be provided by the student. Rentals are not available from the School.

Prepaid and Deferred Payment Plans

Several commercial programs for those who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Street, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

Withdrawals and Refunds

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

Complete withdrawal from the University:

Withdrawal dated on or before Saturday of the first week of classes 90%
Withdrawal dated on or before Saturday of the third week of classes 75%
Withdrawal dated on or before Saturday of the fifth week of classes 50%
Withdrawal dated after the fifth week of classes .....none

Regulations governing student withdrawals as they relate to apartment and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

FINANCIAL AID

The following fellowships, scholarships, and loan funds are available to students in the School of Medicine and Health Sciences. Unless otherwise specified, inquiries should be directed to the Financial Aid Office of the Medical Center, George Washington University, 2300 Eye Street, N.W., Washington, D.C. 20037.

Fellowships

Wilbur J. and Edith K. Carr Memorial Fellowship Fund (1965).—By bequest of Edith K. Carr, former trustee of the University. The income from this fund provides fellowships in surgery, medicine, or medical research at the George Washington University Hospital.

Samuel Jordan Graham Fellowship in Surgery (1961).—By bequest, in memory of Judge and Mrs. Graham. The income from this fund, up to $2,000, may be used to assist students who are pursuing postgraduate study or research, preferably in surgery, at the School of Medicine and Health Sciences.

If no individual is conducting such work or deserving of the award, the income may be used to provide one or more scholarships (to cover tuition and other school expenses deemed appropriate) for students in the School of Medicine and Health Sciences. Application should be filed with the Chairman of the Department of Surgery no later than March 1.

Robin Miller Research Fellowship (1953).—A $3,000 fellowship established by bequest of Mrs. Robin Miller for the study of cardiovascular diseases.

Henry Rau Foundation Student Fellowship Grant (1967).—Awarded annually to a student in the School of Medicine and Health Sciences for research in cancer and allied diseases at the George Washington University Clinic.

U.S. Public Health Service Training Grants.—Information concerning training grants in fields of the medical sciences is available at the Office of the Dean for Academic Affairs of the Medical Center.

Scholarships

Scholarships from University funds are offered to full-time students in the M.D. program on the basis of financial need and scholastic achievement. These awards are made for one academic year at a time and are credited directly to the student's tuition bill. Application forms are available upon request from the Financial Aid Office. The deadline for submission is March 15.

Achievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship.—Awarded to a student on the basis of financial need and superior grades. Candidates must be citizens of the United States.

Anna Bartsch Hospital Intern Scholarship (1946).—A partial scholarship established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman intern in the University Hospital.

Dr. Edith SeVille Coale Scholarships (1965).—Provided at the request of Dr. Coale for women in the School of Medicine and Health Sciences. The scholarships are administered by the Zonta Club of Washington. Application should be made to the Financial Aid Office of the Medical Center no later than December 1.

Joseph Collins Foundation Scholarships (1951).—Available to medical students upon application through the Financial Aid Office of the Medical Center.

Morris H. and Pauline L. Goldenberg Scholarship Fund (1979).—Created by ift of Dr. Morris H. (class of 1929) and Mrs. Pauline L. Goldenberg in me- ioriam for father and mother, the income from which will be used for needy nd deserving medical students in the School of Medicine and Health Sciences. reference will be given to students expressing an interest in the study of adiology.

The Garfield and Rose Kass Medical Scholarship (1975).—Awarded on the asis of need to a worthy student in the School of Medicine and Health Sci- nces.

Ki-Wives of Washington Scholarship Fund (1958).—Three scholarships vailable to students in the School of Medicine and Health Sciences.

Sidney A. Levine Scholarship Fund (1971).—Established to assist medical tudents on the basis of need and academic performance.

Thomas M. Peery Scholarship (1974).—Awarded on the basis of need to a worthy student in the School of Medicine.

School of Medicine Scholarship Fund (1968).—Established by gifts of vari- ous and anonymous donors to assist medical students.

Gordon Fay Willey Scholarship (1974).—Awarded to students whose par- ents are U.S. citizens who are or were enlisted men, non-commissioned officers and officers below the grade of Major in the Army or Air Force or Captain in the Navy of the United States.

Winslow Foundation Scholarship (1974).—Available to medical students who are residents of Maryland, the District of Columbia, or North Carolina, on the basis of need.

Medical Student Research Scholarships and Traineeships.—For student participation in the research programs of the School of Medicine and Health Sciences or special training in research methods. Research scholarships are ordinarily awarded for full-time activity during the summer months; research traineeships support part-time work during the academic year. Scholars are "matched" with members of the faculty in accordance with their mutual interests. Trainees are designated by the departments responsible for the programs. These programs have been sponsored by the National Institutes of Health. In addition a number of research scholarships have been made available through the Washington Heart Association.

School of Medicine Scholarship Fund

Scholarship aid is awarded from income on endowments that have been established by gifts from various donors for tuition awards to students in the School of Medicine and Health Sciences. Listed below are the endowments that support the School of Medicine Scholarship Fund:

Anna Bartsch Scholarship Fund (1946).—Established by Dr. Anna Bartsch-Dunne as a memorial to her mother. Awarded to a woman in the School of Medicine and Health Sciences "of outstanding scholarship, character, and promise, who intends to make the practice of medicine her life profession."

Jack I. Bender Scholarship Fund (1967).—Established by the family of Jack I. Bender as a memorial to their father. Awarded annually to a student on the basis of academic performance and need.

Everett Lamont Bradley Scholarship Fund (1954).—By bequest of Alice R.H. Bradley in memory of her son, for a student in the School of Medicine and Health Sciences.

Elma B. Carr Scholarship Fund (1976).—Created from income distribution of the Elma B. Carr, M.D. Trust, the income to be used for scholarships in the School of Medicine.

Oliver C. Cox Scholarship Fund (1973).—Established in memory of Dr. Oliver C. Cox, "for the establishment, support and maintenance of endowed scholarships in medicine."

Loughran Medical Scholarship (1976).—A partial scholarship established by the Mary and Daniel Loughran Foundation, Inc., for residents of the Washington metropolitan area. Such residency must have been established prior to the commencement of the recipient's undergraduate studies. Awarded 1978–79 and every third year thereafter.

David Perry Steinman Memorial Scholarship Fund (1960).—Established by friends and classmates. Awarded annually to a second-year student in the School of Medicine and Health Sciences on the basis of need and academic performance.

James J. Whisman Scholarship Fund (1966).—By bequest of James J. Whisman for needy and deserving students in the School of Medicine and Health Sciences.

Columbian Women Scholarship Funds

The Columbian Women Scholarships are awarded to women students on the basis of financial need and scholastic attainment. Candidates must have completed a minimum of 15 hours at this University with a minimum *B* (3.0) average, or the equivalent. A letter of application for these scholarships should be addressed to the Chairman, Columbian Women Scholarships, care of the Alumni Office, George Washington University, Washington, D.C. 20052, no later than May 15 for the fall semester, and January 1 for the spring semester. Scholarship aid is awarded from income of the following endowments:

Estelle M. Corbett Scholarship Fund (1973).—Created by gift of Elma Williams for tuition aid for a medical student.

Jessie Fant Evans Scholarship Fund (1967).—Established by bequest of Jessie Fant Evans, former Trustee of the University, for tuition aid.

Lewes D. and Myrtle H. Wilson Memorial Scholarship Fund (1926).—Established by Elizabeth Wilson, as a memorial to her parents, for tuition aid.

Loan Funds*

A.M.A. Medical School Loan Fund.—Created in 1964 by the American Medical Association, to be loaned to students.

Doreen and Donald Brown Loan Fund.—This fund has been established to provide aid to worthy and needy medical students.

Morris and Gwendolyn Cafritz Foundation Loan Fund for Medical Students.—Created in 1977 by the Morris and Gwendolyn Cafritz Foundation, to be loaned to students.

* See the George Washington University School of Medicine and Health Sciences *Financial Aid Handbook* for more complete information.

Carr Loan Fund.—Created in 1962 by Edith K. Carr, to be loaned to stu-
nts.

Abraham I. Gimble Medical School Loan Fund.—Created in 1977 by gift
Dr. Abraham I. Gimble, to be loaned to deserving and needy students.

Katharine Graham Medical School Loan Fund.—Created in 1978 by gift
Katharine Graham, to be loaned to deserving and needy students.

Himes Loan Fund.—Created in 1957 by Joseph H. Himes.

Kellogg Medical School Loan Fund.—Created in 1942 by the W.K. Kellogg
oundation, to be loaned to students.

Dr. Esther A. Nathanson Memorial Medical Loan Fund.—Created in 1977
memory of Esther A. Nathanson, A.B. 1922, M.D. 1925, by her sister,
die C. Nathanson, to be loaned to deserving and needy students.

Pfizer Loan Fund.—Created in 1953 by Charles Pfizer and Company, Inc.,
be loaned to students.

School of Medicine Medical Student Loan Fund.—Created in 1952 by
chool of Medicine students, and augmented by a bequest from the estate of
thel L. Murray to be loaned to students.

Strauss Medical School Loan Fund.—Created in 1975 by gift of Lewis H.
trauss and Mrs. Lewis L. Strauss in memory of Honorable Lewis L. Strauss,
o be loaned to students.

Sutherland Loan Fund.—Created in 1941 by gift of Rose L. Sutherland and
ther donors.

Waller Loan Fund.—Bequest of Helen S. Waller received in 1973, to be
oaned to deserving and needy students.

Janice and George Wasserman Medical Student Loan Fund.—Created in
1978 by the George Wasserman Foundation, Inc., to be loaned to deserving
nd needy students.

Wrather Loan Fund.—Created in 1967 by gift of Mrs. W.E. Wrather in
nemory of her husband, to be loaned to students.

In addition, financial assistance is available through the—

*American Medical Association Medical Education Loan Guarantee Program
(1960).*—Available to medical school students (beyond the first semester of
he M.D. degree program) who are recommended by the Financial Aid Office.

Catherine Breen Student Loan Fund (1972).—Established by alumni of the
School of Medicine and Health Sciences in honor of Catherine Breen, former
Assistant to the Dean of the Medical Center. Available to needy students who
are candidates for the degree of Doctor of Medicine. Applications should be
made to The George Washington University Medical Alumni Association.

Health Professions Student Loan Program.—This fund is available to a full-
time student pursuing a course of study leading to the degree of Doctor of
Medicine. Interns, residents, students engaged in premedical or other profes-
sional training, and students enrolled in programs of study other than those
leading to the degree mentioned above are *not* eligible for these loans.

A candidate must (1) be a citizen of the United States or have such immi-
gration status and personal plans as to indicate an intention to become a per-
manent resident of the United States, (2) be in need of the amount of the loan
to be able to pursue the course of study, and (3) be in good standing with the
School. Inquiries concerning deadlines and applications should be directed to
the Financial Aid Office of the School of Medicine.

National Direct Student Loan Program.—This fund is available for full-time
students in good standing with the school in which they are enrolled. Students

must be citizens or permanent residents of the United States. All loans from the program are made on the basis of financial need. Applications for medical students are distributed by the Financial Aid Office.

Jessie B. Martin Loan Fund (1967).—Established by friends of Jessie B. Martin, former Editor of Academic Publications at the University. An emergency fund for loans up to $200, repayable in 30-60 days, with interest rate of 3 per cent per annum. Application should be made to the Director of the Office of Student Financial Aid of the University.

PRIZES

Janet M. Glasgow Award of Outstanding Achievement, American Medical Women's Association, Inc.—Awarded annually if the student standing first in the graduating class is a woman.

American Medical Women's Association, Inc. Scholarship Achievement Citation.—Awarded annually to those female students who are considered "honor graduates" when ranked against all other students in the graduating class.

Samuel M. and Miriam S. Dodek Prize (1967).—Established in memory of Professor Bernhard Zondek, the eminent discoverer of the endocrinology of the human female reproductive cycle. Awarded annually to a member of the graduating class who has attained a commendable knowledge and understanding of the field of female endocrinology.

Allie S. Freed Prize (1957).—Awarded annually to a member of the graduating class who has demonstrated exceptional proficiency in the field of preventive medicine.

Walter Freeman Prize (1966).—Awarded annually to a student in the graduating class who submits the best essay based on original investigation.

Alec Horwitz Prize (1959).—Awarded annually to a senior who has demonstrated exceptional proficiency in the field of surgery.

Oscar Benwood Hunter Prize (1952).—Established by The George Washington University Medical Society, now known as The George Washington University Medical Alumni Association. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pathology.

Jacobi Medical Society Prize (1962).—Established in memory of Dr. Abraham Jacobi, the founder of pediatrics practice in the United States. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in pediatrics.

Howard Kane-A.F.A. King Obstetrical Society Prize (1937).—Established in memory of Dr. Howard Kane and Dr. A.F.A. King, who served as Professors in the School of Medicine and Health Sciences. Awarded annually to a member of the graduating class who has demonstrated outstanding ability in obstetrics and gynecology.

Dr. Harold Lamport Biomedical Research Prize.—Established by the Lamport Foundation in memory of the late, distinguished physiologist, Dr. Harold Lamport, awarded annually to the student writing the best paper on original laboratory investigation in physiology.

Lange Medical Publications Prize.—Awarded annually to two members of the graduating class who are considered outstanding. The prize consists of the graduate's choice of four books published by Lange Medical Publications.

Huran W. Lawson Prize (1957).—Established by Mrs. Lawson in memory of er husband, who was a distinguished member of the Medical Staff of the Uniersity, presented annually to a member of the graduating class who has demstrated exceptional proficiency in the field of obstetrics and gynecology.

Benjamin Manchester Prize (1966).—Established by a grateful patient in onor of Dr. Benjamin Manchester, clinical professor of medicine. Awardd annually to a member of the graduating class who has an outstanding record nd shows promise of real humanitarianism in the practice of medicine.

C.V. Mosby Book Prize.—Awarded annually to five members of the gradating class who are considered outstanding by their classmates. The prize onsists of the graduate's choice of a book published by C.V. Mosby Company.

Julius S. Neviaser Prize in Orthopaedic Surgery (1956).—Awarded annually o the senior who scores the highest grade in a written examination and clinical spects of orthopaedic surgery.

John Ordronaux Prize (1907).—By bequest, awarded annually to the member f the graduating class who has the highest scholastic standing.

William G. Schafhirt Prize (1966).—By bequest, awarded annually to a senior tudent for the best original essay or thesis on some medical subject of current ublic interest.

Upjohn Achievement Prize.—A prize and an inscribed plaque awarded nnually to a member of the graduating class selected by his or her classmates n the basis of outstanding scholastic and personal achievement.

IONOR SOCIETIES

Alpha Omega Alpha.—National Honor Medical Society. Third- and fourthear candidates for the M.D. degree meeting the qualifications specified by the onstitution of the Society are eligible for election to membership.

William Beaumont Medical Society.—Medical students who have performed original research in the life sciences are eligible for membership, based upon he submission of an acceptable abstract of the research and election by soiety members. Outstanding students present their research findings at the nnual Student Research Day. The Society also sponsors guest lectures in nedical research and assists students in finding research opportunities within he Medical Center.

Howard Kane-A.F.A. King Obstetrical Society.—The 15 third- and fourthyear candidates for the M.D. degree who maintain the highest grades in their work in obstetrics are eligible for membership.

CENTER FOR AGING STUDIES AND SERVICES

The Center offers opportunities for learning through a multi-disciplinary, comprehensive, gerontology/geriatrics program. The program encompasses education, training, research, and direct service activities in the field of aging throughout the University. The Center for Aging Studies and Services is based in the Department of Health Care Sciences. Its major components in the Medical Center are the Division of Geriatric Medicine, the Gerontology Program, and the Adult and Geriatric Nurse Practitioner Program.

Division of Geriatric Medicine

The Division of Geriatric Medicine is directly responsible for the develop ment of curriculum in geriatric medicine, for patient care activities, and fo clinical research in aging. Students may develop an area of concentration i gerontology/geriatrics through the Division.

Gerontology Program

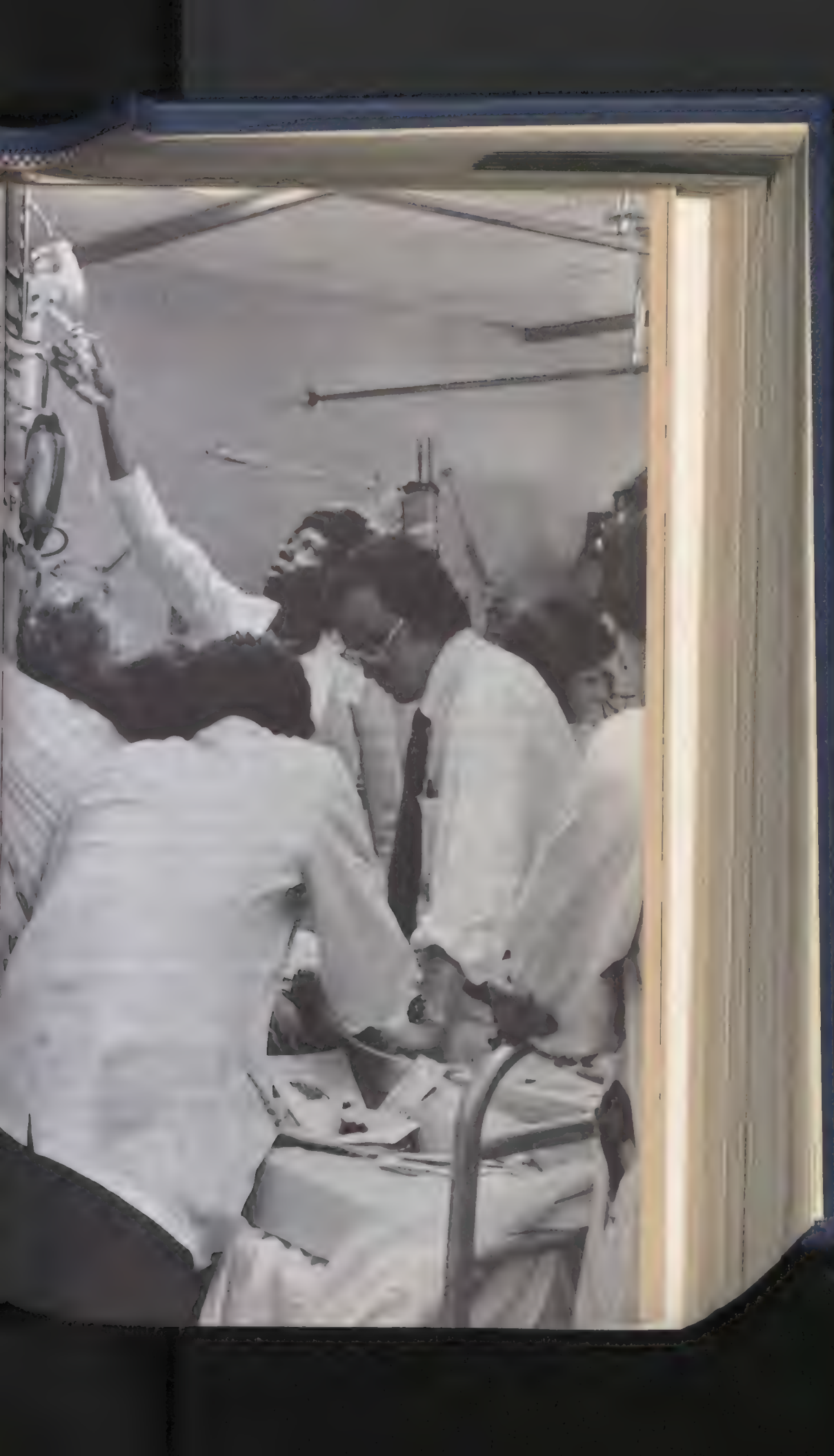
The Gerontology Program has been responsible for introducing courses with specific focus on aging into the curriculum of several schools in the University as well as in the School of Medicine and Health Sciences. A Master of Arts in Special Studies with a concentration in gerontology is available through the Graduate School of Arts and Sciences and a variety of courses in gerontology and geriatric care are available throughout the University. In addition to the courses with a focus on aging described in this bulletin under Health Care Sciences (HCS 142, 143, 144, 153, 154, 193, 194) and under Psychiatry and Behavioral Sciences (Pchi 417) the following courses are offered by other University departments:

Psyc 188	Attitudes Toward Death and Dying
SLP 158	Society and Aging
Soc 151–52	Problems of Urban Social Systems
Soc 160	Death and Dying: A Sociological Perspective
Soc 181	Major Social Processes: Aging
Soc 280	The Sociology of Aging
Soc 281	Problems of Growing Old in American Society
Educ 353	Counseling Older Persons
Educ 383	Interviewing/Counseling Skills for Human Resource Developers
Gern 201	The Biology of Aging
Gern 205	Public Policy and Aging
Gern 290	Practicum in Gerontology
HSA 236	Introduction to Long-term Care Administration
HSA 237	Seminar: Managing the Long-term Institution
HSA 255	Issues in Gerontology
Law 579	Clinical Studies in Urban Law

Two community-based service programs developed under the Gerontology Program provide opportunities for experiential learning. A Professional Services Center at St. Mary's Court, a congregate housing facility for elderly persons, offers comprehensive support services to the residents. An interdisciplinary staff with special training in clinical gerontology will supervise students in this clinical setting. The Community Projects in Aging is an intergenerational service/learning program that affords students opportunities to interact with older people on a one-to-one basis through health and social service agencies.

Adult/Geriatric Nurse Practitioner Program

The Nurse Practitioner Program prepares registered nurses to practice mainly in primary care settings or long-term care facilities. A Nurse Practitioner Traineeship from the Department of Health, Education, and Welfare is available to students from health manpower shortage areas. For fuller detail on the curriculum of this program see the description under Allied Health Programs.



UNDERGRADUATE PROGRAMS IN ALLIED HEALTH

Programs of study in allied health at the School of Medicine and Health Sciences include those disciplines and skills that are allied to medicine in the delivery of health care and health education. The faculty of the School recognizes that modern medical practice requires increasing numbers of nonphysician health care professionals; that such allied health personnel are appropriately educated in an academic health center; and that new roles for health care providers require the introduction of new curricula in allied health and nursing education.

Programs in Allied Health are currently offered leading to the degrees of (1) Associate in Science, with areas of concentration in Medical Laboratory Technique, Nuclear Medicine Technology, and Radiologic Technology; and (2) Bachelor of Science in the fields of Health Science, Medical Technology, Nursing Anesthesia, Environmental Health, and Radiologic Sciences and Administration, or with designation as Physician's Assistant or Nurse Practitioner.

Certificates are also awarded in the Medical Technology, Physician's Assistant, Nursing Anesthesia, and Nurse Practitioner programs.

ADMISSION

The right is reserved to refuse admission to any student with an academic record which creates doubt of ability to succeed in college, or who, for any other reason, would not be an acceptable student. In the selection process, there is no discrimination because of sex, race, color, religion, or national or regional origin.

An application for admission to degree candidacy should be accompanied by a nonrefundable $15 application fee, payable by check to The George Washington University. The application fee is waived for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants should submit the application form and complete credentials by June 1. Some programs may require an earlier admissions date.

Forms for application for admission or readmission are available at, and should be returned to, the Office of Admissions, George Washington University, Washington, D.C. 20052.

Admission to Degree Candidacy

The following are required for admission to degree candidacy in all Allied Health programs:

1. Graduates of secondary schools must have a diploma based upon an acceptable academic record from an accredited secondary school. Applicants who have not graduated from secondary school must have satisfactory scores on the General Educational Development (GED) High School Level tests.

2. Students who have completed secondary school within two years of the date of their application for degree candidacy and who have not attended any other college or university must have acceptable scores on the Scholastic Aptitude Test (SAT) of the College Entrance Examination Board (CEEB)*; applicants without previous college work who have completed secondary school more than two years before their date of application may substitute acceptable scores on the College-Level Examination (CLEP) or acceptable scores on the General Educational Development (GED) High School Level test.

3. Students who have completed fewer than 12 semester hours of acceptable course work at an accredited college or university before applying for degree candidacy must have a secondary school record and acceptable scores on one of the three examinations listed in item 2 above.

4. Students who have completed 12 or more semester hours of acceptable course work at an accredited college or university must have maintained an overall quality-point index of 2.0 in course work; they must be in good standing as to scholarship and conduct and be eligible to return to the last previously attended institution in the same semester for which admission is sought to George Washington University. A student who has been academically dismissed or suspended more than twice is ineligible for consideration for at least five years from the date of the last suspension or dismissal.

REQUIRED CREDENTIALS

1. A transcript of secondary school work, or, for students who are not graduates of secondary schools, scores on the General Educational Development Test. Transcripts must be forwarded directly from the institution attended to the Office of Admissions. A transcript submitted directly by the student is not acceptable.

2. For applicants who have attended any college, university or other institution of higher learning, an official transcript forwarded to the Office of Admissions by each institution attended regardless of whether credit was earned or desired.

3. Scores on standardized examinations (ACT, SAT, CLEP, etc.) forwarded by the administering agency directly to the Office of Admissions.

4. Records from service schools.

ADVANCED TUITION DEPOSIT

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students, including those readmitted. This

* The College Entrance Examination Board test is preferred; however, the American College Testing battery (ACT) scores will be accepted.

deposit is due May 1 for students entering in the fall semester, and Decembe 15 for students entering in the spring semester. The deposit is credited towar tuition and is not refundable.

Admission as a Nondegree Student

A student who wishes to take individual courses in allied health program without applying for degree candidacy must apply for admission to the Univer sity as an undergraduate unclassified student in the School of Medicine an Health Sciences. The Office of Allied Health and the chairman of the de partment offering the course shall determine whether admission will be grant ed to nondegree students. Credits earned as a nondegree student may be transferred to degree programs at the University provided the course(s) are applicable to the desired curriculum and the student meets the requirements of the degree program for which application is made.

Advanced Standing

Advanced standing may be awarded for course work taken at other accredited institutions at the college or university level or for nontraditional classroom or clinical experience. Students are reminded, however, that they must satisfy the residence requirement for their degree programs (see pages 62, 64) no matter how much advanced standing may be granted.

It is the responsibility of the student to have certified official transcripts of all course work taken at other institutions or the results of examinations sent by the issuing institution or agency directly to the Office of Admissions, George Wash ington University, Washington, D.C. 20052. If the applicant has fewer than 30 semester hours of acceptable credit (grades of *C* or better on academic work from an accredited institution) at the time the application is submitted, the ap plicant must have the secondary school record sent directly to the Office of Ad missions from the school.

The University reserves the right to refuse credit for transfer in part or in whole, or to allow it provisionally. Credit so given may be withdrawn for sub sequent poor work. No time limitation will be placed on the transfer of credits from other institutions, with the exception of the area of vocational compe tence (clinical applications as dictated by individual programs). Credit will not be granted for such work completed five or more years prior to applica tion unless proficiency and/or continued maintenance of skills are demon strated.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Unlimited advanced standing may be awarded for appropriate course work completed with a minimum grade of *C* or its equivalent at other accredited in stitutions of higher learning, provided that the course is applicable to or com parable with a course in the required curriculum, or that the degree program to which the student has been admitted has provisions for elective credit toward which the credit for advanced standing may be applied. Although a grade of *D* is not acceptable for transfer, a course in which a student has received the grade of *D* may be used to satisfy a curriculum requirement. I

may not, however, be counted toward the total number of semester hours required for the degree, and it may not be repeated without the approval of the faculty advisor.

CREDIT FOR NONTRADITIONAL CLASSROOM OR CLINICAL EXPERIENCE

Assuming there is no duplication of course work earned, a maximum of 60 semester hours of advanced standing may be awarded on the basis of nontraditional classroom or clinical experience, by a combination of any of the methods listed below:

Credit from Service Schools.—A limited amount of credit may be assigned for selected service school instruction received since 1941. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

Special Departmental Examinations.—A student may request any department to offer the student a special examination covering the subject matter of any specific course. Approval of such a request is not automatically granted; the student must offer evidence of sufficient occupational or educational background to indicate a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examination will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparation, administration, and grading of the examination.

Credit for College Entrance Examination Board College-level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations (with the exception of the English composition and mathematics examinations) passed at the 50th percentile or above (college sophomore norms). Credit is assigned for the Subject Examinations passed at the level recommended in the College Board model policy. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 592, Princeton, N.J. 08540.

Credit for New York State Board of Regent's Examination.—Applicants for degrees who present proper certification of award of a degree at the Associate's level from the New York State Board of Regents *may* be awarded a maximum of 60 semester hours of advanced standing.

Credit for Correspondence Courses.—A maximum of 30 semester hours of advanced standing *may* be awarded through the successful completion of appropriate correspondence courses offered by accredited colleges and universities.

Credit through United States Armed Forces Institute (USAFI) Examinations.—A maximum of 30 semester hours of advanced standing may be assigned for approved United States Armed Forces Institute college-level examinations passed with satisfactory scores.

Credit for educational programs in industrial and other noncollegiate organizations.—A maximum of 12 semester hours of advanced standing may be awarded for course work performed in noncollegiate programs using criteria developed by the American Council on Education and the New York State Board of Regents.

Currently registered degree candidates must obtain permission from the Office of Allied Health before registering to take examinations, correspondence courses, or courses at other accredited institutions.

Readmission

Students previously registered in the University who were not registered during the immediately preceding semester (summer sessions excluded), must apply for readmission. The final date for applying is the same as that for entering students (see page 46). Students who apply as degree candidates and who were previously registered as nondegree students, or who attended one or more institutions of higher learning during absence from the University, must have complete official transcripts sent to the Admissions Office of this University from each institution attended. Applications for readmission are considered on the basis of regulations currently effective.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of the last registration at this University and who have not since registered at another institution.

Students From Foreign Institutions

Application, required records, and scores on the *Test of English as a Foreign Language* (see below) should be received from international students no later than March 1.

REQUIRED RECORDS

Applicants must request all educational institutions attended to send *directly* to the Office of Admissions, George Washington University, Washington, D.C. 20052, official credentials listing subjects studied, grades received, examinations taken and degrees received. Certified copies of diplomas and certificates from secondary schools and all colleges and universities attended are required. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

ANGUAGE TESTS

tudents whose native tongue is not English are required to take the *Test of English as a Foreign Language* (TOEFL), and have the scores submitted to the Office of Admissions. Students are responsible for making arrangements for taking the test by addressing inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

In addition to the TOEFL, an admitted student may be required to report to the Admissions Office to make arrangements for taking an English Placement Test for foreign students prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study.

REGULATIONS FOR UNDERGRADUATE STUDENTS IN ALLIED HEALTH PROGRAMS

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may attend only those classes for which registered. Regular attendance is expected. A student may be dropped from any course for undue absence.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of the School of Medicine and Health Sciences may be dismissed from the University.

GRADES

Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. In certain courses, an alternate grading system of *P* (Pass) and *NP* (No Pass) may be used. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *D* or better was received, unless required to do so by the department concerned. A

written statement to this effect must be submitted to the Registrar by the ap propriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Whenever a grade has not been assigned, the symbol *I* (Incomplete), the symbo *IP* (Progress), the symbol *W* (Authorized Withdrawal), or the symbol *Z* (Un authorized Withdrawal) will be recorded. The symbol *I* indicates that a satis factory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's con trol, is unable to complete the work of the course, and if the instructor is in formed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, the instructor may initiate an appropriate grade change. A grade of *I* automatically becomes a grade of *F* one calendar year after the date of the last class meeting in the semester for which the grade of *I* was assigned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index, obtained by divid ing the number of quality points by the number of semester hours for which the student has registered, both based on the student's record in this Univer sity. Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses in which the grades of *W*, *I*, or *IP* are assigned are not considered in determining the index, except that a course in which the grade of *I* has been assigned will be considered when a formal grade has been recorded. Grades earned at other institutions are not con sidered in computing the quality-point index.

DEAN'S HONOR LIST

Students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list is limited to full time students registered for a minimum of 12 semester hours and part-time stu dents registered for a minimum of 12 semester hours over two consecutive se mesters, which may include a summer term.

PROBATION

A student who has attempted a minimum of 12 semester hours of course work and whose cumulative quality-point index is below 2.00 is placed on probation for the period in which he or she next attempts 12 additional semester hours of work. A student whose attendance or conduct has been unsatisfactory may be placed on disciplinary probation for the period in which he or she next attempts 12 additional semester hours of work.

SUSPENSION

A student whose cumulative quality-point index remains below 2.00 after a 12-semester-hour period of probation is suspended.

A student suspended for poor scholarship may not register for course work, even as an auditor. The student may apply for readmission after the lapse of either the fall or spring semester following suspension. Evidence must then be presented to the chairman of the department concerned demonstrating a better qualification to pursue college-level course work. A student suspended twice for poor scholarship may not be readmitted after the second suspension.

Withdrawal

Withdrawal from a course or from the University requires the permission of the Office of Allied Health. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see "Withdrawals and Refunds," page 59).

All charges for courses dropped without the approval of the Office of Allied Health must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

Changes in Program of Study

Changes within the School of Medicine and Health Sciences' Allied Health Programs.—A student may not substitute one course for another, drop courses (see "Withdrawal," above), change status from credit to audit or audit to credit without the approval of the Office of Allied Health.

Change from one section to another of the same course may be made with the approval of the Office of Allied Health and the chairman of the department concerned.

Change from one area of concentration to another within the School of Medicine and Health Sciences may be made with the approval of the Office of Allied Health and the chairman of the department concerned. All requirements of the course of study to which the change is made must be met.

Transfer within the University.—Application for transfer to another college, school, or division must be made to the Office of Admissions. A maximum of 30 semester hours earned in the Division of University and Summer Students may be applied toward a bachelor's degree in the School of Medicine and Health Sciences.

Credit

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing.—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Post-Admission Transfer Credit

A student who plans to attend another institution and apply credit so earne toward graduation from this University must first secure the written approval o the Office of Allied Health. In no event will credit in excess of what migh be earned in a similar period in this University be recognized.

Balance Sheet

Sometime during each undergraduate student's first semester, the Office o Allied Health will issue a balance sheet showing the amount of work com pleted and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives

Transcripts of Record

Official transcripts of student records are issued on request of the student o former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $1 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript.

Continuous Enrollment

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the Office of Allied Health to inactive status (see below) he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

Leave of Absence

Should a degree student find it necessary to interrupt active pursuit of the degree, he or she may petition the Office of Allied Health for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

Inactive Status

A student may be considered in continuous pursuit of a degree while not enrolled in courses at the University when engaged in attendance at another institution with prior approval of the Office of Allied Health to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received; or non-course instructional activities unique to particular Allied Health programs.

To be enrolled in inactive status a student must request, in advance of the year or semester concerned, and be granted approval for the specific activity desired. This status is generally limited to one year; no fees are assessed students while in this status.

Graduation Requirements

Degrees are conferred in February, May, and September. Graduating Allied Health students participate only in the May commencement ceremonies of the School of Medicine and Health Sciences.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which registered; and be free from all indebtedness to the University. Registration, either for course work or on the "continuous registration" fee basis, is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form *must* be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship.—The student must meet the scholarship requirements for the particular degree for which registered.

Curriculum.—Minimum curriculum requirements for each degree are stated on pages 61 and 64.

Residence.—A minimum of 18 semester hours of course work in the area of concentration for the Associate in Science degree and a minimum of 30 semester hours of course work in the area of concentration for the Bachelor of Science degree must be completed while registered in the School of Medicine and Health Sciences. This requirement applies to students transferring within the University as well as to students transferring from other institutions.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

With Distinction

In all undergraduate divisions of the University a baccalaureate degree may be conferred "With Distinction," at the discretion of the faculty, if a student meets the specific requirements of the college or school in which enrolled.

Students in the Allied Health programs must have a quality-point index of 3.50 or higher in all course work taken at this institution. To be eligible a student must have completed at this institution at least one-half of the courses required for the degree.

FEES AND FINANCIAL REGULATIONS FOR UNDERGRADUATE STUDENTS IN ALLIED HEALTH PROGRAMS

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 1980 summer sessions and the academic year 1980–81. (See below for projected tuition increases for 1981–84.)

Tuition Fees

*Full-time on-campus program (12 or more semester hours), each semester	$1,700.00
Part-time on-campus program, for each semester hour	125.00
Summer Sessions, for each semester hour	117.00

University Center Fee (charged all students registered on campus)

For students registered for 11 or more semester hours on campus: Each semester	50.50
For students registered for less than 11 semester hours on campus: For each semester hour for which the student registers	4.75

Energy Surcharge—Because the price of fuel oil has risen out of proportion to the projected increase of tuition fees, and because this price is anticipated to rise even further in 1980-81 by an indeterminate amount, an energy surcharge will be assessed at the time of registration. The amount of this surcharge will be determined and announced prior to July 1, 1980.

Additional Course Fees

In certain courses offered by Columbian College of Arts and Sciences, additional fees, such as laboratory and material fees, are charged as indicated in the course descriptions in the *Undergraduate and Graduate Bulletin*. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. If breakage of apparatus is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

Associate in Science	$10.00
Bachelor of Science	25.00

Residence Hall Fees (see pages 15–16)

Special Fees and Deposits

Application fee	$15.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student	100.00

* The annual tuition for the Nurse Practitioner and Physician's Assistant Program is $5,100.00, payable in three equal installments on or before registration for each semester. The Summer Session portion of the program is considered a full regular semester.

Housing deposit, nonrefundable, charged each applicant for residence hall space	100.00
Admission tests (when required)	6.00–12.00
Late-registration fee, for failure to register within the designated period	15.00
Late-payment fee (see "Payment of Fees," below)	15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for non-payment of fees (see "Payment of Fees," below)	35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason	15.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
For each examination to qualify for advanced standing and for each special examination	5.00
English test for foreign students (when required)	5.00
Laboratory checkout fee, for failure to check out of Chemistry laboratory by the date deadline set by the instructor*	10.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for the first two copies is $2 each, fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following privileges: (1) the services of the Student and Alumni Career Services Office; (2) the use of the University Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

Projected Tuition and Fee Increases 1981–84

So that students and their parents may plan more realistically for a total four-year period, tuition increases for the academic years 1981–82, 1982–83, and 1983–84 have been estimated as follows:

Increase by year (full-time undergraduate students):

1981–82	$300.00
1982–83	400.00
1983–84	400.00

Increase by semester hour (graduate and part-time undergraduate students):

1981–82	$11.00
1982–83	14.00
1983–84	15.00

It is not possible to project future economic data with certainty. Increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next laboratory period.

hopes to keep tuition increases as low as possible, but it is obligated to maintain
a sound financial basis. Economic conditions in the recent past, particularly a
they affect private educational institutions, have been extremely variable and
significant increases in tuition in excess of the above limits may be required

Payment of Fees

No student is permitted to complete registration or attend classes until all
charges are paid. Tuition and fees for each semester are due and payable in full
at the Office of the Cashier at the time of each registration. Checks should be
made payable to George Washington University, with the student identifica-
tion number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining
student accounts for tuition, various fees, and room and board charges. A stu-
dent registered for six semester hours or more may sign a deferred payment con-
tract with the Student Accounts Office at the time of each registration permit-
ting payment of one-half of the total tuition and fees (except for fees payable in
advance) at the time of registration, and the remaining half on or before Oc-
tober 22, 1980 (for the fall semester), and March 4, 1981 (for the spring se-
mester). No deferred payment is permitted for the summer sessions, with the
exception of full-time students in the Nurse Practitioner and Physician's As-
sistant Programs. Interest at the rate of eight per cent per annum on the unpaid
balance will be charged from the date of registration to the date payment is
made.

Students receiving tuition assistance in the form of scholarships, government
tuition contracts, or other forms of tuition awards are not permitted to sign de-
ferred payment contracts unless the total tuition and fee charges exceed the
value of the tuition awards by $750.00 or more. Under such circumstances the
student may be permitted to pay one-half of the amount due from the student
at the time of registration and to defer the balance by signing a deferred pay-
ment contract.

Students who fail to make any payment when due will be automatically
charged a $15 late-payment fee and will be subject to the interest charge of eight
per cent per annum. Accounts which become 30 days past due will be finan-
cially encumbered. In the event a student's account is financially encumbered,
the student forfeits rights to the use of deferred payment contracts in future
semesters, and the Student Accounts Office will notify the Registrar to withhold
grades, future registration privileges, transcripts, diplomas and other academic
information until the account is settled financially. Financial settlement will re-
quire payment in full of all amounts due the University in addition to a finan-
cial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered
for credit.

Returned Checks.—A student whose check is returned unpaid by the bank for
any reason will be charged a Returned Check Fee. If the check is not paid
within 15 days, the student will forfeit all rights to check cashing at the Uni-
versity, and future payments for tuition, dormitory, food service, and other
special fees will require payment by cash, certified check, or money order.

epaid and Deferred Payment Plans

veral commercial programs for those who wish to pay for college on a onthly basis are available. Terms and conditions vary, but most provide a life surance policy in the contract. For specific details and applications, address quiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply f applications for these various programs, but will be happy to provide guid-nce to students and parents.

Withdrawals and Refunds

pplications for withdrawal from the University or for change in class sched-le must be made in writing to the Office of Allied Health. Notification to an structor is not an acceptable notice (see "Withdrawal," page 53).

In authorized withdrawals and changes in schedule, cancellations of semester uition charges and fees will be made in accordance with the following schedule or the fall and spring semesters:

. *Complete withdrawal from the University**:

Withdrawal dated on or before Saturday of the first week of classes 90%
Withdrawal dated on or before Saturday of the third week of classes 75%
Withdrawal dated on or before Saturday of the fifth week of classes 50%
Withdrawal dated after the fifth week of classes .....none

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for re-funds as adopted by the American Council on Education.

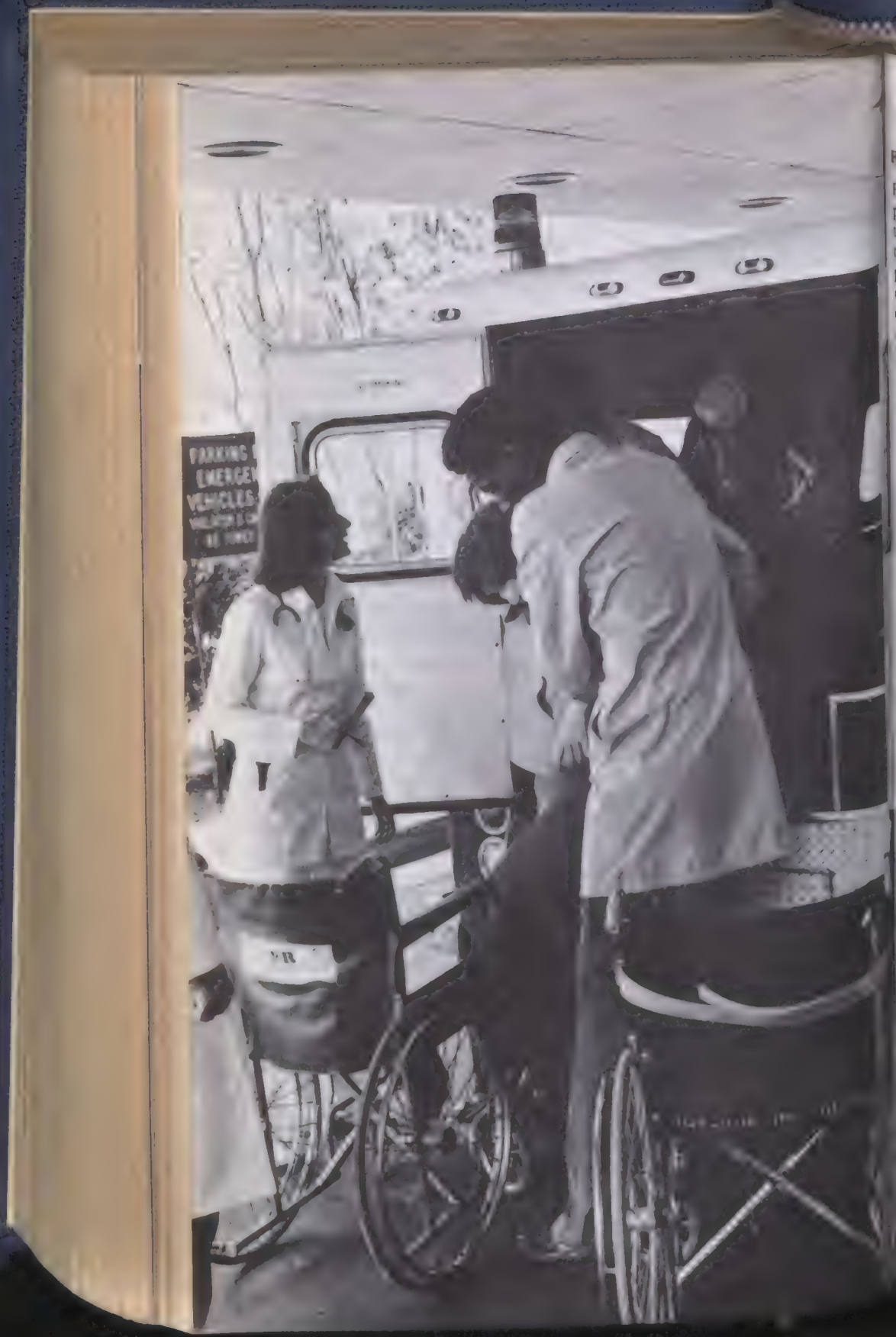
In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

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* Regulations concerning withdrawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of Classes*.


PARKING
EMERGEN
VEHICLES

INANCIAL AID

For full-time undergraduate students, George Washington University has a rogram of financial assistance consisting of scholarships, loans, grants, part-ime employment, or any combination of these resources. The University par-icipates in the National Direct Student Loan, Supplemental Educational Op-portunity Grant, and College Work-Study programs. Financial aid is awarded on the basis of the student's scholastic record, financial need, and qualities of leadership. Complete information concerning financial assistance is avail-able from the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

REQUIREMENTS FOR THE DEGREE OF ASSOCIATE IN SCIENCE

The satisfactory completion of a minimum of 60 semester hours of course work is required for the degree of Associate in Science; however, some departments may set the requirements above the minimum. The course work must be distributed as follows:

1. **Human Competence**
   A minimum of six semester hours in English Composition (Engl 9 or 10, and 11 or 12), plus a minimum of six semester hours of meaningful initiation into the humanities, social studies, or mathematics.
2. **Subject Competence**
   The number of semester hours required depends on the student's specific area of concentration. However, students must elect courses related to allied health sciences in biological sciences, mathematics, or physical sciences. (Students may not use the same mathematics courses to satisfy both the human competence [see above] and subject competence requirements.)
3. **Vocational Competence**
   A minimum of 30 semester hours in vocational competence skills related to the area of concentration.
4. **Elective**
   The number of elective hours depends on the number of semester hours of specific required courses the student has in the selected program of study; in some programs the student may be allowed to choose electives, but in others the student may be required to elect specific courses.

Students who plan to pursue a bachelor's degree are advised to plan their associate's degree program so that they will satisfy the prerequisites to the degree of their choice.

Scholarship Requirements

An over-all quality-point index of 2.0 is required for course work leading to the degree of Associate in Science. A quality-point index of 2.50 is required for

course work in the student's area of concentration. See pages 51–52 for explanation of the grading system and the quality-point index.

Residence Requirement

A minimum of 18 semester hours of course work in the area of concentration must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

MEDICAL LABORATORY TECHNIQUE PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in medical laboratory technique is offered only to military students off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 46–47. Mature students who do not meet these requirements *may* be considered for degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50. The qualifying course work must include nine semester hours in biological sciences, chemistry, or mathematics, and six semester hours in at least two other areas.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 61 semester hours of course work is required:

Human Competence (not an area of concentration)—Engl 9 or 10 and 11 or 12 (or equivalent); Math 3 and 6 (or equivalent) *or* Math 3 and either a humanities or a social science elective.

Subject and Vocational Competence*—Chem 9 or 11 (or equivalent); Path 13, 14, 15, 16, 17, 18, 19, and 20.

NUCLEAR MEDICINE TECHNOLOGY PROGRAM

The program of study leading to the degree of Associate in Science with a concentration in nuclear medicine technology is offered both on and off campus.

ADMISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 46–47. Applicants must be at least 18 years of age by the time of first registra-

* Area of concentration—This requirement is fulfilled by successful completion of Medical Laboratory Technique School (NEC 8506).

n. A personal interview or a letter of recommendation may be required some students. Mature students who do not meet the standard requirements y be considered for admission to degree candidacy after the satisfactory mpletion of a probationary period of 15 semester hours of course work taken residence at George Washington University with a minimum quality-point dex of 2.50.

GREE REQUIREMENTS

e satisfactory completion of 60 semester hours of course work is required. oc 101 and HCS 110 and 111, or their equivalents, are prerequisite to all her courses in nuclear medicine technology.

uman Competence (not an area of concentration)—Engl 9 or 10 and 11 or 12 (or uivalent); social science (as determined by the faculty advisor; Psyc 1 recom-ended); humanities (selected from art, music, philosophy, or religion).

ubject and Vocational Competence*—Rad 43, 44, 55, 56, 57, 58, 59, 65, 66, 72, 75, , 82, 93, 94, 98.

ADIOLOGIC TECHNOLOGY PROGRAM

he program of study leading to the degree of Associate in Science with a con-entration in radiologic technology is offered only to military students off ampus.

MISSION TO DEGREE CANDIDACY

General requirements for admission to degree candidacy are stated on pages 6–47. A personal interview or a letter of recommendation may be required for some students. Mature students who do not meet the standard requirements may be considered for admission to degree candidacy after the satisfactory completion of a probationary period of 15 semester hours of course work taken in residence at George Washington University with a minimum quality-point index of 2.50.

DEGREE REQUIREMENTS

The satisfactory completion of 61 semester hours of course work is required:

Human Competence (not an area of concentration)—Engl 9 or 10 and 11 or 12 (or equivalent); social science (as determined by the faculty advisor); humanities (as determined by the faculty advisor).

Subject and Vocational Competence†—Rad 40, 41, 42, 50, 51, 60, 61, 62, 70, 71, 80, 90, 95, 96, 97, 99.

* Area of concentration—This requirement is fulfilled by successful completion of Nuclear Medicine Technology School (NEC 8416).

† Area of concentration—This requirement is fulfilled by successful completion of Radiologic Technology School (NEC 8452).

REQUIREMENTS FOR THE DEGREE OF BACHELOR OF SCIENCE

The satisfactory completion of a minimum of 120 semester hours of course work is required for Bachelor of Science programs; however, some departments may set the requirements above the minimum. The course work must be distributed as follows:

1. **Human Competence**
   A minimum of six semester hours in English composition (Engl 9 or 10 and 11 or 12) plus 24 semester hours of meaningful initiation into any two of the three general areas of the humanities, social science, or mathematics.
2. **Subject Competence**
   A minimum of 30 semester hours of didactic information related to allied health sciences. This requirement may include the biological sciences, mathematics, or the physical sciences.
3. **Vocational Competence**
   A minimum of 60 semester hours in vocational competence skills related to the area of concentration.

Scholarship Requirements

An over-all quality-point index of 2.0 is required for course work in programs leading to the Bachelor of Science degree. A quality-point index of 2.50 is required for designated course work in the student's area of concentration. See pages 51–52 for explanation of the grading system and the quality-point index.

Residence Requirement

A minimum of 30 semester hours of course work in the area of concentration must be satisfactorily completed in residence in the School of Medicine and Health Sciences.

HEALTH SCIENCES PROGRAM

The Bachelor of Science degree program in Health Sciences is currently offered to Advanced Hospital Corps students off-campus.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the degree of Bachelor of Science in Health Science, distributed as follows:

Human Competence—30 semester hours: 6 hours in English composition; 3 hours in psychology; 21 hours in the humanities and social sciences.

ject Competence*—30 semester hours: HCS 010, 016, 015, 119, and 116 are uired, plus an additional 16 semester hours of didactic information in the bio- ical sciences, mathematics, and chemistry.

cational Competence*—60 semester hours: HCS 092, 093, 125, 126, 102, 022, 7, 068, 096, 180, 175.†

EALTH SCIENCES—ENVIRONMENTAL HEALTH

ne Bachelor of Science in Health Science degree with a major area of concen- ation in Environmental Health requires the completion of a minimum of 120 mester hours of course work distributed as follows:

uman Competence—30 semester hours: A minimum of 6 semester hours of Eng- h composition, plus 24 semester hours of meaningful initiation into the humanities d social sciences.

Recommended courses are in report writing, public speaking, philosophy, litera- re, art, music, drama, economics, sociology, psychology, anthropology, political ience, human relations, or other appropriate courses.

bject Competence—30 semester hours: A minimum of 30 semester hours of didac- c information related to allied health sciences. Course work must include a mean- gful initiation into the following areas: Mathematics (introductory algebra and igonometry, analytic geometry, calculus, and statistics); Chemistry (inorganic and rganic, biochemistry, nuclear chemistry); Physics (mechanics, heat, light, sound, agnetism, electricity, modern physics); Biology (zoology, anatomy, physiology, cology).

Vocational Competence‡—60 semester hours: HCS 022, 101, 122, 184, 197, 185, 83, 181, 182, and 199 are required, plus an additional 30 semester hours of course work directly related to environmental health. This may include supervised field experience in environmental health, or other approved courses. Credit may be awarded for successful completion of Preventive Medicine Technician School.

MEDICAL TECHNOLOGY PROGRAM

The satisfactory completion of 120 semester hours of course work is required for the degree of Bachelor of Science in the field of medical technology.

RESIDENCE REQUIREMENT

A minimum of 60 semester hours must be spent in residence for the degree of Bachelor of Science in the field of medical technology, including the 12-month

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* Area of concentration—This requirement is fulfilled by successful completion of Advanced Hospital Corps School (NEC 8425).

† A corresponding number of credits for approved course work in a directly applicable allied health field may be substituted for HCS 175 and 180.

‡ Core courses which constitute major area of concentration. Must be completed with a cumulative quality point index of 2.50 or better.

medical technology program at the University Hospital in the fourth year (Path 121, 122, 123, 124, 125, 126, 127, 128).

CURRICULUM

1. **First Two Years**

		Semester Hours
Engl:	Engl 9 or 10 and 11 or 12	6
Humanities:	Six semester hours selected from one of the following combinations: Art 31–32; Art 71–72; Engl 51–52; Engl 71–72; Engl 191–92; Mus 3 and 4; Rel 9 and 10; or Rel 59 and 60	6
Math:	Math 3, 6	6
	NOTE: the Math 3 requirement may be satisfied by offering two years of high school algebra acceptable for admission; the Math 6 requirement may be satisfied by offering one-half year of high school trigonometry acceptable for admission.	
Science:	BiSc 11–12, 111	12
	Chem 11–12, 22	12
Social Science:	Six semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40; Hist 71–72; PSc 1 and 2; PSc 2 and 3; or	6
	Soc 1 and 2	12
Elective:	Courses in the humanities and social studies	60

2. **Junior Year**—Chem 50; four semester hours selected from BiSc 104, 127, 128, 148, 163, 164, 165; 22 hours of nonscience electives.

3. **Senior Year**—Path 121, 122, 123, 124, 125, 126, 127, 128.

The fourth-year courses constitute the major. Each candidate must make application to take the 12-month medical technology program at the University Hospital; this should be done early in the third year. Although admission to the pre-degree program does not assure acceptance into the medical technology program at the Hospital, George Washington University students are given preference.

PHYSICIAN'S ASSISTANT PROGRAM

The program leading to the degree of Bachelor of Science with designation as Physician's Assistant requires the satisfactory completion of 120 semester hours of course work.

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 46-47. In addition, three letters of recommendation, a personal interview, one year (2,000 hours) of patient-care experience, and satisfactory completion of a college-level course in general chemistry are required.

HOLARSHIP REQUIREMENTS

holarship requirements are stated on page 64. Candidates for the degree Bachelor of Science with a designation as Physician's Assistant must main- n an overall quality-point index of 2.00 for course work taken in the Phy- ian's Assistant program. A quality-point index of 2.50 is required for those urses designated in the core curriculum (area of concentration). Each student ust complete and pass all courses for which registered in any given semester fore being allowed to advance to the next semester.

ESIDENCE REQUIREMENT

minimum of 75 semester hours in the preclinical and clinical portion of the achelor of Science degree curriculum must be completed in residence at the chool of Medicine and Health Sciences.

EGREE REQUIREMENTS

he satisfactory completion of a minimum of 120 semester hours is required r the Bachelor of Science degree with a designation as a Physician's Assis- nt, distributed as follows:

uman Competence—30 semester hours: 6 hours in English composition; 24 hours the humanities and social sciences.

ubject and Vocational Competence—90 semester hours:

Basic Health Sciences—HCS 110; Bioc 111; Micr 128; Path 129, 152; Phar 158; Phyl 111.

Basic Clinical Sciences—HCS 109, 119, 125,* 134,* 137, 140, 145, 146, 147, 148.

Clinical Clerkship—HCS 160,* 163,* 166, 169, 172,* 175,* 178, 198, 199.

Other Required Courses—HCS 113, 116.

ERTIFICATE

A certificate is awarded upon completion of the 90-semester-hour sequence of required and elective courses in health care sciences.

The Bachelor of Science Degree with a designation as a Physician's Assistant s also offered to military personnel off-campus. Military students in the off- campus program must complete the following courses:

Human Competence—30 semester hours: 6 semester hours in English composition; 24 semester hours in the humanities and social sciences.

Subject and Vocational Competence —90 semester hours:

Basic Health Sciences—HCS 110; Phys 111; Bioc 111; Micr 128; HCS 151.*

Basic Clinical Sciences—HCS 109, 127,* 128,* 129,* 134,* 137, 146, 147, 148.

Clinical Clerkships—HCS 167,* 169, 172,* 175, 189, 190, 191, 192, 198.

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* Designates area of concentration course work which must be completed with a cumulative quality-point index of 2.50.

Other Required Courses—A minimum of 30 semester hours of didactic cours work must be completed in the areas of biological and physical sciences. This r quirement may be waived on the basis of successful completion of Advanced He pital Corps School (NEC 8425) or comparable course work.

NURSING ANESTHESIA PROGRAM

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on page 46–47. In addition, candidates for the degree must also fulfill the following requirements:

1. They must have graduated from a state-approved school of nursing Nurses with an Associate degree may be accepted into the program afte completing a minimum of twelve months of practical experience in critica care nursing.
2. They must be licensed as registered professional nurses in at least one state, U.S. territory, or the District of Columbia.
3. They must satisfy the requirements of the school of anesthesia at one of the affiliated hospitals.

ADVANCED STANDING

The general provisions for awarding of advanced standing are stated on page 48. In addition, the following specific criteria apply for the Bachelor of Science degree in Nursing Anesthesia.

1. Students who are graduates of two- or three-year nursing school programs and who have had a minimum of twelve months of practical experience in critical-care nursing *may* receive up to 45 hours of advanced standing credit in Nursing.
2. Students who have earned a B.S. degree in Nursing *may* receive up to 60 hours of advanced standing credit in Nursing.
3. Certified Registered Nurse Anesthetists will receive credit in Nursing on an individual basis. Students seeking award of advanced standing credit on the basis of anesthesia work experience must provide evidence of demonstrated clinical competence.

Students who graduated from nursing school more than five years ago and have not been active in nursing during the last five years may be required to take National League of Nursing or New York State Board of Regents examinations.

SCHOLARSHIP

Students must maintain an overall quality point index of 2.50 on all nursing anesthesia courses (area of concentration). Any student who does not maintain a 2.50 average may be required to take additional course work in order to obtain a minimum 2.50 average on the 30 hours of required courses.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the Bachelor of Science degree in Nursing Anesthesia, distributed as follows:

1. Thirty semester hours of course work in the area of human competence, including at least six semester hours in English (Engl 9 or 10, and 11 or 12), three semester hours in Psychology (Psyc 001), and 21 semester hours of meaningful initiation into two of the following areas—social studies, humanities, and mathematics.
2. Thirty semester hours of course work in the area of subject competence, including course work in the biological and physical sciences. (Note: Advanced standing credit awarded for nursing school experience may be used to fulfill this requirement.)
3. Sixty semester hours of course work in the area of vocational competence skills directly related to nursing anesthesia, consisting of the following courses:

YEAR I: Phar 21, 22, 110, 111; Anes/Phar 195, 191; HCS 110, 134; Phyl 111; Anes 198.

YEAR II: Anes 193, 194.

All students must complete Year I course work, in residence, with an overall quality-point index of 2.50 or better. Certified Registered Nurse Anesthetists may waive Year II of clinical course work on the basis of demonstrated clinical competence after successful completion of Year I course work.

CERTIFICATE

A certificate is awarded upon completion of the 60-semester-hour sequence of required courses in the nursing anesthesia program.

NURSE PRACTITIONER PROGRAM

ADMISSION TO DEGREE CANDIDACY

The general requirements for admission to degree candidacy are stated on pages 46–47. Candidates for the degree of Bachelor of Science with designation as Nurse Practitioner must also fulfill the following requirements:

1. They must have been graduated from a school of nursing with an over-all quality-point index of at least 2.00 or the equivalent.
2. They must be licensed as registered nurses in at least one state or the District of Columbia.
3. They must have had a minimum of three years' experience in nursing practice in hospital and ambulatory settings.
4. They must have three letters of recommendation forwarded from employers, supervisors in the health field, and/or acquaintances.

Preference will be given to applicants who have made arrangements with a physician or an institution to be employed as a nurse practitioner.

SCHOLARSHIP

The grades of *P* (Pass) and *NP* (No Pass) are given. A student who has received a grade of *NP* in any of the preclinical courses will be ineligible to con-

tinue in the clinical portion of the program until the course has been repeated and a grade of *P* has been received. Progress through each portion of the clinical phase will be evaluated by the faculty in charge of that particular rotation.

ADVANCED STANDING

General provisions for advanced standing are listed on page 48. In addition, students may receive up to 60 semester hours of advanced standing for successful completion of nursing school. No advanced standing will be granted for courses in the required area of concentration.

RESIDENCE REQUIREMENT

A minimum of 45 semester hours of course work in the area of concentration must be completed in residence in the School of Medicine and Health Sciences.

DEGREE REQUIREMENTS

The satisfactory completion of a minimum of 120 semester hours is required for the degree of Bachelor of Science with designation as a Nurse Practitioner, distributed as follows:

Human Competence—30 semester hours: 6 semester hours in English composition; 24 semester hours in the humanities and social sciences, which must include HCS 109 and 193.

Subject and Vocational Competence —90 semester hours:

Clinical Health Sciences—HCS 110, 125, 134, 140, 142, 143, 144, 145, 147; Micr 128; Path 129, 152; Phyl 111.

Clinical Rotations—HCS 153, 157, 179.

Electives—HCS 137, 154, 165.

A minimum of 30 semester hours of course work in the physical, natural, and mathematical sciences is required. Advanced standing awarded for nursing school experience may be used to fulfill this requirement.

CERTIFICATE

Nurse Practitioner certification will be granted to those students who meet the requirements for admission to the degree program and who complete the 45-semester-hour area of concentration.

RADIOLOGIC SCIENCES AND ADMINISTRATION PROGRAM

The program leading to the degree of Bachelor of Science in the field of Radiologic Sciences and Administration requires the satisfactory completion of a minimum of 120 semester hours of course work. This program is designed for registered technologists in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology who wish to continue their education at the baccalaureate level.

DMISSION TO DEGREE CANDIDACY

e general requirements for admission to degree candidacy are stated on pages 5–47. In addition, students applying to the program must be registered technologists or registry-eligible within the first academic semester. A personal interview or a letter from the principal or dean of the school previously attended required. Students whose previous schooling suggests inadequate preparation physics and mathematics may be required to complete successfully Rad 92 efore placement in either Rad 167 or Rad 171.

DVANCED STANDING

eneral provisions for advanced standing are stated on page 48. Students ay be granted up to 48 semester hours of advanced standing credit if (1) ey have completed study within the last five years, with a quality-point dex of at least 2.50 or a grade average of at least 80 per cent, at a radiologic chnology, nuclear medicine technology, or radiation therapy technology school hat is accredited by Joint Review Committee on Education Programs in Radiologic Technology or Nuclear Medicine of the Council on Medical Education of he American Medical Association, or (2) they are certified as American Registered Radiologic Technologists, Nuclear Medicine Technologists, or Radiation Therapy Technologists.

SCHOLARSHIP

Scholarship requirements are stated on page 64.

DEGREE REQUIREMENTS

Human Competence—A minimum of 30 semester hours is required, including BAd 102, 105; Engl 9 or 10 and 11 or 12; Psyc 1; Soc 1. Recommended electives include Engl 101; Hum 26; Psyc 151; Soc 129; SpDr 111, 121; or other courses in the humanities or social sciences.

Subject and Vocational Competence—A total of 92 semester hours is required. Of these, a maximum of 48 semester hours is allowed for course work in an American Medical Association approved program in either diagnostic radiologic technology, nuclear medicine technology, or radiation therapy technology. The remaining 44 semester hours consist of the following required courses:

1. **Radiologic Sciences**—ClEn 101; Rad 167, 171, 175, 176 or 177, 190, 195.
2. **Radiologic Administration**—HSA 142, 153, 154, 170; Psyc 144; Rad 140, 145 or 147 or 149, 150; Soc 124.

Required or Recommended Courses in Allied Health Programs Offered in Other Divisions of the University

The following courses are offered by Columbian College of Arts and Sciences o the School of Government and Business Administration, and are either require or recommended in specific undergraduate programs in the School of Medicin and Health Sciences. Students are reminded, however, that not all these course are acceptable even as electives in certain Allied Health Programs. Student should consult with the program advisor in choosing electives for the particula program in which they are enrolled.

Courses acceptable to meet human competence requirements:

Humanities	Social Sciences
Art History	American Civilization
Classics	Anthropology
East Asian Languages and Literatures	Economics
English	Geography and Regional Science
Germanic Languages and Literatures	History
Music	Journalism
Philosophy	Political Science
Religion	Psychology
Romance Languages and Literatures	Sociology
Slavic Languages and Literatures	
Speech and Drama	

ACCOUNTING

1 **Introductory Accounting** (3)

Basic understanding of accounting concepts, procedures, analyses, and reports; the accounting measurement and communications of significant economic and financial data. Laboratory fee, $25 per semester.

AMERICAN CIVILIZATION

71–72 **Introduction to American Civilization** (3–3)

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance.

ANTHROPOLOGY

1–2 **Introductory Anthropology** (3–3)

Anth 1: survey of man's origin, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior.

ART HISTORY

31–32 **Survey of Western Art** (3–3)

A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art.

71–72 **Introduction to the Arts in America** (3–3)

Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present.

BIOLOGICAL SCIENCES

11–12 **Introductory Biology for Science Majors** (4–4)

Lecture (3 hours), laboratory (3 hours). Biological principles and problems designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester.

104 **Comparative Vertebrate Anatomy** (4)

Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $24.

111 **Introductory Microbiology** (4)

Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, phylogenetic relationships, and economic importance. Prerequisite: one year of chemistry. Material fee, $24.

127 **Genetics** (3)

Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action.

128 **Genetics Laboratory** (1)

Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $24.

148 **Histology** (4)

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24.

163 **Human Physiology** (3)

Introduction to the function of organ systems of the human body.

164 **Human Physiology Laboratory** (1)

Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $28.

165 **Vertebrate Physiology** (4)

Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite: BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $28.

BUSINESS ADMINISTRATION

102 **Fundamentals of Management** (3)

Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking.

105 **Personnel Management** (3)

The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities.

CHEMISTRY

11–12 **General Chemistry** (4–4)

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester.

22 **Introductory Quantitative Analysis** (4)

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28.

50 **Introduction to Organic Chemistry** (4)

Lecture (3 hours), laboratory (3 hours). A terminal course for students in related disciplines. Prerequisite: Chem 12 or 16. Laboratory fee, $28.

ECONOMICS

1–2 **Principles of Economics** (3–3)

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics.

ENGLISH

9 **English Composition: Language as Communication** (3)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours per week for a maximum of 10 weeks. Special fee, $25.

10 **English Composition: Language as Communication** (3)

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure.

11 **English Composition: Language and the Arts and Sciences** (3)

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and of diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12.

12 English Composition: Language in Literature (3)

Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and in diction, and on logical thought, by the study of literary genres and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11.

20 The Writing of Reports (3)

Offered only off campus. Theory and practice in the writing of technical reports. Prerequisite: Engl 9 or 10 and 11.

43–44 Classical Humanities (3–3)

Offered only off campus. Interdisciplinary study of the origins of Western thought. Reading and intensive class discussions of selections from the Bible and from five works each semester from the following authors: Homer, Hesiod, Aristophanes, Plato, Aristotle, Aeschylus, Euripides, Sophocles, Herodotus, Thucydides, Lucretius, Marcus Aurelius, Epictetus, Polybius, St. Augustine. Background lectures on the major intellectual, artistic, economic, and social movements.

45–46 Humanities in the Modern World (3–3)

Offered only off campus. Interdisciplinary study of modern Western thought from the Renaissance to the 20th century. Reading and intensive class discussion of five works each semester from the following authors: Machiavelli, Pope, Voltaire, Rousseau, Goethe, Tolstoy, J.S. Mill, Zola, Nietzsche, Kierkegaard, Freud, Kafka, Koestler, T.S. Eliot. Background lectures on the major intellectual, artistic, economic, and social movements.

51–52 Introduction to English Literature (3–3)

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature.

71–72 Introduction to American Literature (3–3)

Historical survey. Engl 71: from beginnings to the Civil War. Engl 72: from the Civil War to present.

101 Expository Writing (3)

Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12.

191–92 Introduction to European Literature (3–3)

Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid*; dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann.

EXPERIMENTAL HUMANITIES

***26 Environmental Issues** (3)

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy.

* Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science.

GEOGRAPHY AND REGIONAL SCIENCE

1 Introduction to Geography (3)
(Formerly Geog 51)
General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts.

2 Introduction to Economic Geography (3)
(Formerly Geog 52)
Examination of the basic principles which determine the location of economic activities.

HEALTH SERVICES ADMINISTRATION

142 Financial Management in Health Care Institutions (3)
Consideration of the nature, analysis, and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process.

153 Survey of Health Care Organization (3)
Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system.

154 Introduction to Hospital Management and Procedures (3)
Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager.

170 Quantitative Methods in Health Care Administration (3)
Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise, and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas.

HISTORY

39–40 European Civilization in Its World Context (3–3)
Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present.

71–72 Introduction to American History (3–3)
Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present.

MATHEMATICS

3 College Algebra (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry.

6 Plane Trigonometry (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor).

9 General Mathematics I (3)

Logic, sets, foundations of the number system, abstract mathematical systems, groups.

10 General Mathematics II (3)

Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices.

30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry.

31 Single Variable Calculus I (3)

Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Analytic geometry. Prerequisite: Math 30 or equivalent.*

51 Mathematics for the Social and Management Sciences I (3)

Notion of function, graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration.

52 Mathematics for the Social and Management Sciences II (3)

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51 or 53.

MUSIC

3 Introduction to Musical Understanding (3)

Introductory history of musical styles, related to listening; elements and materials of music.

4 Survey of Music Literature (3)

Introductory study of musical forms, structures, and textures; aural analysis of selected literature.

* Math 30 may be waived as a prerequisite by examination on scheduled dates.

PHILOSOPHY

50 Introduction to Philosophy (3)
Readings from major philosophers and study of philosophic positions from Plato to Sartre.

POLITICAL SCIENCE

1 Introduction to Comparative and International Politics (3)
Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies.

2 Introduction to American Politics and Government (3)
Structure, powers, and processes of the American political system.



PSYCHOLOGY

1 **General Psychology** (3)
Fundamental principles underlying human behavior.

8 **Psychology of Motivation and Personality** (3)
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized.

22 **Introduction to Educational Psychology** (3)
The contributions of psychology to education; emphasis on learning.

144 **Personnel and Industrial Psychology** (3)
Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity.

151 **Social Psychology** (3)
Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism, and war.

RELIGION

9 **The Hebrew Scriptures** (3)
Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities.

10 **The New Testament** (3)
Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles.

59 **Religions of the East** (3)
Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto.

60 **Religions of the West and Near East** (3)
History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments.

SOCIOLOGY

1 **Introductory Sociology** (3)
General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior.

2 **Major Social Issues** (3)
Critical examination of three selected social issues in contemporary Amer
ican society.

124 **Medical Sociology** (3)
Social factors and processes related to the etiology and treatment of phys
cal and mental illnesss; medical occupations and professions, medical or
ganizations, problems of delivery of health care services.

129 **Race and Minority Groups** (3)
Analysis of relationships between dominant and minority groups in so
ciety, particularly in the United States; nature and range of problems
analysis of the phenomenon of prejudice.

SPEECH AND DRAMA

1 **Communicative Speaking and Listening** (3)
Basic theories and principles of speech communication; composition, de
livery, and criticism of speaking in interpersonal, group and public situa
tions. Recording fee, $4.

111 **Business and Professional Speaking** (3)
Study of the communication process in business and professional speak
ing; practice in presenting technical reports; selling policies, programs
and services; interviews; conferences; speech in training and supervisor
activities.

121 **Group Discussion and Conference Leadership** (3)
Process of thinking and problem-solving in committees and small groups
methods of leading discussions and conferences. Prequisite: SpDr
or permission of instructor.

STATISTICS

•51 **Introduction to Business and Economic Statistics** (3)
Lecture (3 hours), laboratory (1 hour). Frequency distribution, descri
tive measures, probability, sampling, estimation, tests of hypotheses,
gression and correlation, time series, index numbers. Laboratory fee, $

•91 **Principles of Statistical Methods** (3)
Probability, frequency distributions and their characteristics, descript
measures, estimation, tests of hypotheses, regression and correlati
Laboratory fee, $18.

• Stat 51; 53, *Introduction to Statistics in Social Sciences;* and 91 are related in their subject ma
and credit hours for only one of the three may be applied toward a degree.

SCHOOL OF MEDICINE AND HEALTH SCIENCES COURSES OF INSTRUCTION

The School of Medicine and Health Sciences serves other divisions of the University by making available to nonmedical students certain undergraduate and graduate courses in the following departments: anatomy, biochemistry, microbiology, pathology, pharmacology, and physiology. The courses listed represent those offered as of July, 1979, and are subject to change. The University reserves the right to withdraw any course announced.

STAFF OF INSTRUCTION

The Staff of Instruction listed under each department and at the back of this *Bulletin* is current as of July, 1979.

EXPLANATION OF COURSE NUMBERS AND SYMBOLS

A number in parentheses after the name of the course indicates number of semester hours of credit which may be earned. Five semester hours of credit per four-week elective period are granted for all fourth-year courses in the M.D. program.

Courses numbered from 1 to 100 are for first- and second-year undergraduate allied health students. Courses numbered from 101 to 200 are for third- and fourth-year undergraduate allied health students. Courses in the basic science departments numbered from 201 to 400 are for candidates for the M.D. degree and for students in the Graduate School of Arts and Sciences. All other courses numbered from 201 to 400 are primarily for candidates for the M.D. degree.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting	**Art**	Art
AmCv	American Civilization	**ArTh**	Art Therapy
Anat	Anatomy	**Bioc**	Biochemistry
Anes	Anesthesiology	**BiSc**	Biological Sciences
Anth	Anthropology	**BAd**	Business Administration
ApSc	Applied Science	**Cart**	Cartography

Chem	Chemistry
Chin	Chinese
CE	Civil Engineering
CH&D	Child Health and Development
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
HSA	Health Services Administration
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opht	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
Rel	Religion
SLP	Service-Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

Anatomy

Chairman: R.S. Snell

Professors E.N. Albert, F.D. Allan, T.N. Johnson, M.J. Koering, R.S. Snell
Professorial Lecturers J.L. Angel, T.S. Reese, M.F. Brightman
Associate Professor K.E. Johnson
Associate Professorial Lecturer J.A. Di Paolo
Assistant Professors B.E. Gilson, J.M. Kerns, D.B. Parsons *(Research)*, J.M. Rosenstein, F.J. Slaby, R.J. Walsh
Assistant Professorial Lecturer M.F.K. Ericksen

115 **Anatomy for New Health Practitioners** (3) Staff
(Formerly Anatomy for Anesthetists)
Same as HCS 110.

*201 **Anatomy** (10) Staff
Integrated anatomical disciplines: regional gross dissection, histology, embryology. (Fall)

202 **Gross Anatomy** (6) Snell and Staff
For graduate students. Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Embryology** (1) Snell and Allan
For graduate students. Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) T. Johnson, Kerns
For graduate students. Gross and microscopic anatomy of central nervous system and special senses. Students who have received credit for Anat 204 may not register for Anat 212. Laboratory fee, $13. (Fall)

205 **Human Microscopic Anatomy** (3) Albert and Staff
For graduate students. Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) Koering
Preparative techniques for various biological tissues, operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
For graduate students. Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
For graduate students. Preparation of a significant audiovisual program of some aspect of human anatomy. Laboratory fee, $20. (Spring)

* Required for medical students.

210 The Use of Computers in Anatomy (2) Snell

For graduate students. Applying computer techniques to the problems of learning anatomy. Limited enrollment. Laboratory fee, $20. (Spring)

212 Neurobiology (3) Staff

For graduate students. Same as Idis 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system. Lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

221–22 Seminar (1–1) Gilson

For graduate students. Research reports and discussions of special topics by guest lecturers, staff, and graduate students. Medical students encouraged to attend. (Academic year)

249 Introduction to Anatomical Research (1) Staff

For graduate students. Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 Physical Anthropology (1) Angel

Variations in humans and factors affecting them, human evolution and racial differences, anatomy and culture of ancient man. (Spring)

253 Brain Tissue Interactions (1) Kerns and Walsh

Lectures on interactions of the CNS with muscular, sensory, and endocrine systems. Student presentations and clinical aspects will be included. (Spring)

254 Fetal Anatomy (2) Allan

Dissection of the midgestational human fetus. Comparison of fetal and adult structures. 20 students. Laboratory fee for nonmedical students, $10. (Spring)

255 Tissues of the Body (1) Albert and Staff

Detailed current information on various organ systems. Prerequisite: Anat 201 or equivalent. (Spring)

256 Teratology (1) Gilson

Etiology and mechanisms of common congenital malformations. Limited enrollment.

260 Electron Microscopy in Cellular Biology—Lecture (1) Koering

Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 Transmission Electron Microscopy (3) Koering

Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Fall and spring)

262 Gross Anatomy of Upper and Lower Extremities (2) Snell and Staff

Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee for nonmedical students, $10. (Spring)

263 **Applied Anatomy of the Autonomic System** (5) Alla
Comprehensive study of the structure and function of the autonom
nervous system. 4-week elective periods.

264 **Gross Anatomy of Head and Neck** (2) Sn
Detailed dissection, supplemented by x-ray anatomy; discussions, assigne
reading. Limited enrollment. Laboratory fee for nonmedical student
$10. (Spring)

265 **Clinical Cell Biology and Electron Microscopy** (5) Albe
Investigation into clinical problems concerning atherosclerosis. 4-week
elective periods.

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned
reading. Limited enrollment. Laboratory fee for nonmedical students.
$10. (Spring)

268 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) Snell and Staf
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned
reading. Limited enrollment. Laboratory fee for nonmedical students.
$10. (Spring)

270 **Dissection of the Human Brain** (1) T. Johnson
Dissection of major pathways and nuclei of the brain with consideration
of ventricular system; conferences and assigned reading. Limited enroll-
ment. Laboratory fee for nonmedical students, $10. (Spring)

272 **Autonomic Nervous System** (1) Alla
Development, microscopic and gross anatomy, function of central an
peripheral components of autonomic nervous system. (Spring)

275 **Advanced Human Embryology** (1) Alla
Microscopic examination of the human embryo at several critical period
during embryogenesis. Prerequisite: Anat 203. Limited enrollment
(Spring)

276 **Advanced Studies in Anatomy** (1) Staf
Lectures and conferences on selected anatomical subspecialties—endo
crinology, teratology, growth, etc. May be repeated for credit. (Spring

279 **Applied Regional Anatomy** (5) Sne
Regional dissection, guided readings, weekly discussions. 4-week electi
periods.

282 **Advanced Neuroanatomy** (5) T. Johnso
Dissection of the human brain, study of slides of the central nervous sy
tem, and an introduction to neurological research. 4-week electi
periods.

284 **Applied Surface Anatomy and Radiology** (5) Sn
Detailed study of anatomical structures which are accessible to examin
tion in the living subject; normal radiology of the body. 4-week electi
periods.

285 **Application of Audio-Visual Techniques to Anatomy** (5) Allan
Students identify, develop, and produce an audio-visual program on a clinically important facet of human anatomy: gross, microscopic, developmental, or neuroanatomical. 4-week elective periods.

288 **Surface Anatomy and Radiology** (1) Snell
Lectures and demonstrations on areas of clinical importance.

291 **Special Projects in Anatomy** (5) Snell
Independent study on an aspect of gross anatomy. 4-week elective periods.

295 **Research** (arr.) Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

299 **Biochemical and Morphological Techniques in Cell Biology** (3) Slaby
Techniques currently used in the isolation of subcellular fractions and their biochemical and morphological characterization.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Anesthesiology

Chairman: C.S. Coakley

Professors S. Alpert, C.S. Coakley, B.S. Epstein, W.L. Marsh, P. Mazel, R.J. Van Houten, H. Weintraub

Associate Professors A.H. Altstatt, B.S. Dunbar, A.I. Fields, P.R. Holbrook, M.L. Kennedy, M.W. Lichtmann, T.H. Oh, M.B.G. Shahvari, J.A. Tam, M.H. Thein, J.E. Zimmerman

Adjunct Associate Professors C.W. Jones, R.H. Norton

Associate Clinical Professor S.N. Albert

Assistant Professors M.D. Abramowitz, S.J. Aidinis, V.A. Argumedo, N.R. Bishop, S.R. Deshmukh, S.S. Edelstein, R.S. Hannallah, M.T. Karna, W.A. Knaus, D.S. Lee, W.A. McGill, A.P. Murray, V.V. Ott, M.M. Pollack, M.J. Shaffer, N.E. Soliman, B.W. Tsai, L.G. Welborn

Adjunct Assistant Professors R.L. Barth, R.F. Berish, C.C. Yu

Assistant Clinical Professors C.A. Albert, W.E. Bageant, B.E. Economopoulos, P.J. Lowenthal, H.W. Manitsas, H.F. Nicodemus, G.K. Palmes

Instructor M.J. Becker

Courses numbered 190 through 198 are for nursing anesthesia students.

190 **Seminar: Anesthesiology** (4) Staf
Small discussion groups on morbidity and mortality from actual and reported cases. Topics related to complications of anesthesia.

191 **Respiratory Care** (3) Staf
Advanced techniques for the care of patients requiring total prolonged respiratory support.

192 **Orientation for Anesthesia** (0) Staf
Lecture, group discussion, and audiovisual presentation. History of anesthesia, legal aspects, ethics, psychology, professional adjustments, department management, and organization.

193 **Methods and Procedures in Anesthesia** (4) Staf
At affiliated hospitals. Lecture, group discussion, and audiovisual presentation. Anesthesia techniques, positions in anesthesia, types of anesthetic required to meet the needs of different surgical specialties, and related topics.

194 **Principles of Clinical Anesthesia** (26) Staf
Twelve-month course at affiliated hospitals. Supervised clinical training and experience. The student is assigned patients, organizes and administers anesthesia, and follows the patients through their total hospitalization. Designed to satisfy the American Association of Nurse Anesthetists requirements.

195 **Electronics for Medical Personnel** (2) Staf
Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care units. Power, biomedical voltages and transducers, blood pressure and heart rate monitors, displays, telemetry, special purpose instruments, safety hazards analysis techniques for technical equipment procurement. (Fall)

198 **Pathological Physiology and Anesthesia** (3) Staf
Review of patho-physiology of major organ systems in relation to anesthesia. Clinical implications of various disease states, their interaction with anesthetics, and effects on anesthetic management.

210 **Anesthesiology Research Laboratory** (2) Craft and Shahvari
Participation in and observation of the various aspects of laboratory research, including anesthesia, surgery, physiology, pharmacology, and research techniques.

*302 **Clinical Clerkship** (2) Staf
Clinical preoperative evaluation, surgical and obstetrical anesthesia, infant and adult resuscitation, inhalation therapy, management of patients in coma, shock, and other problems which may be encountered in medical practice. 1 week—Univ. Hosp., 1 week—Walter Reed Gen. Hosp., Wash. Hosp. Center. (2-week periods throughout academic year) Staf

380 **Anesthesiology** (5) Staf
Clinical experience in preoperative evaluation; surgical, obstetrical, and surgical anesthesia; infant and adult resuscitation; inhalation ther-

* Required for medical students.

monitoring and blood gas determinations. 4-week elective periods. Univ. Hosp.

381 **Cardiovascular Anesthesia** (5) Weintraub, Shahvari

Clinical experience in the total perioperative evaluation and management of patients with significant cardiovascular disease (open heart, major vascular, or other surgery). Techniques of data evaluation from major hemodynamic monitoring. May include participation in ongoing clinical or laboratory research projects. 4-week elective periods. Univ. Hosp.

382 **Neurosurgical Anesthesia** (5) Staff

Principles of clinical management of the neurologic patient in the perioperative period. Physiology and pharmacology of intracranial pressure and cerebral blood flow and metabolism. Intracranial pressure monitoring and the effects of respiratory nursing, and physiotherapy maneuvers on neurosurgical patients. Participation in research projects in both the OR and ICU may be involved. 4-week elective periods. Univ. Hosp.

383 **Obstetrical Anesthesia** (5) Craft

Principles of the clinical management of the obstetrical patient in the peridelivery period. Physiologic alterations of pregnancy and perinatal pharmacology. Participation in the research laboratory using the chronic maternal-fetal sheep preparation, and in clinical research projects. 4-week elective periods. Univ. Hosp.

384 **Intensive Care Unit** (5) Shahvari, Zimmerman

Evaluation and management of respiratory failure, rationale and use of automatic ventilators, chronic airway management, cardiovascular support, and intensive care. 4-week elective periods. Univ. Hosp.

386 **Intensive Care Unit** (5) Staff

Evaluation and management of respiratory failure, rationale and use of automatic ventilators, airway management, cardiovascular support techniques, and intensive care medicine. 4-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Anesthesiology Elective** (arr.)

The department arranges for students to spend elective periods at other institutions. Interested students should contact Dr. George Morales.

Biochemistry

Chairman: A.L. Goldstein

Professors J.M. Bailey, A.L. Goldstein, H.H. Hess, B.W. Smith, C.R. Treadwell (*Emeritus*), G.V. Vahouny

Professorial Lecturers E.P. Anderson, W.W. Burr, Jr., P.H. Fishman, G. Guroff, P.J. Marangos, C.R. Merril, M.L. Minthorn, Jr., A.N. Schechter, J.C. Smith, Jr., E. Steers, Jr.

Associate Professors L.L. Gallo, A. Kumar, G.A. Walker, G.B. Thurman (
search)

Assistant Research Professors R.W. Bryant, C.E. Low, T.L. Low, R.A. M
ing, M.A. Vander Maten, J.Y. Vanderhoek

Assistant Professorial Lecturer C.L. Trichilo

101 **Chemistry for Allied Health Sciences** (2) Tric

111 **Biochemistry for Allied Health Sciences** (3) Wa

*201 **Medical Biochemistry** (8) S
Lectures and laboratory; emphasis on basic principles and their rela
to medicine. (Fall)

221–22 **General Biochemistry** (3–4) Gallo, Vahouny, and S
A comprehensive course in general biochemistry for graduate student
biomedical sciences and undergraduate students in biology and chemis
Generally, graduate students must register concurrently for Bioc 223
for Bioc 224. However, graduate students taking Bioc 225-26, F
281-82, Micr 241-42 or Phys 223-24 may register for Bioc 221-22 w
out the laboratory. With specific recommendations by the undergradu
advisor and the department, undergraduate students may register for B
221-22 without laboratory. Prerequisite: Chem 152, 154. (Acade
year)

223–24 **Biochemistry Laboratory** (1–1) Gallo and S
Laboratory complement of Bioc 221-22. Concurrent registration in B
221-22 required. Materials fee, $20 per semester. (Academic year)

225–26 **Biomedical Instrumentation** (4–4) Smith and S
Same as Micr 241-42 and Phyl 223-24. Comprehensive study of th
retical and practical application of biomedical instrumentation to
separation, identification, and quantification of materials of interest
biomedical and forensic scientists. Laboratory fee, $50. (Academ
year)

227 **Biochemistry Seminar** (1) Bail
Current literature in biochemistry. Intended for graduate students,
open to a limited number of specially qualified medical students. Conte
differs each time course is offered; may be repeated for credit. (F
and spring)

229 **Biochemistry of Enzymes** (1) E. Anderso
Two separate courses are offered in alternate years, each covering bo
general and advanced material; students may register for these in eith
order and cover the entire content in two years. The full content includ
practical handling of enzymes, kinetics, reaction mechanisms, active si
isozymes, regulation, and other special topics. Prerequisite: Bioc 2
(Fall)

232 **Protein Chemistry I** (1) Steers, Schech
Prerequisite: Bioc 201 or 221. (Fall)

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* Required for medical students.

233 **Protein Chemistry II** (1) — Steers, Schechter

Continuation of Bioc 232. Methods for the study of protein confirmation; determination of active sites of enzymes; mechanisms of reactions at the active site. (Spring)

241 **Isotopes** (3) — Burr

Theoretical characterization of isotopes and their applications in biology and medicine. Attention given to counting, health physics and radiation safety, autoradiography, chromatography. Laboratory fee for nonmedical students, $16. (Spring)

251 **Carbohydrate Metabolism** (1)

Prerequisite: Bioc 201 or 222. (Spring, even years)

252 **Biochemistry of the Brain** (1) — Staff

For medical students; open to limited number of graduate students. Recent biochemical developments in structure, functions, and metabolic processes unique to the brain. (Spring)

254 **Human Nutrition** (1) — Staff

For medical students; open to limited number of graduate students. Application of nutritional principles in humans. (Spring)

256 **Biochemistry of Organ Function** (1) — N. Kramer

For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

260 **Biochemistry of the Steroids** (1) — Dodek

For medical students; open to limited number of graduate students. Basic chemistry of the steroids, pathways of biosynthesis and metabolism, regulatory mechanisms, physiologic effects, clinical measurement of endogenous steroids, clinical manifestations of steroid imbalance, steroid changes in pregnancy, and steroid therapy. (Spring)

262 **Biochemistry of the Lipids** (1) — Vahouny

Discussion of topics of current interest, including digestion, energy production, biosynthesis, function in specialized tissues and subcellular particles. Content differs each time course is offered; may be repeated for credit. (Spring)

264 **Membrane Associated Complex Lipids** (1) — Fishman

Topics will cover the catabolism and biosynthesis of complex sphingolipids; inherited metabolic diseases associated with abnormal sphingolipid metabolism; altered glycosphingolipid biosynthesis associated with malignant transformation; potential roles of gangliosides as membrane receptors for toxins and hormones; aspects of membrane structure and biochemistry.

266 **Biochemical Genetics and Inherited Metabolic Diseases** (1) — Merril

For medical students; open to limited number of graduate students. Biochemical aspects of genetics and contributions of molecular biology to understanding of human mutations and hereditary diseases. (Spring)

*268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: An introductory course in biochemistry and physiology, or permission of the department.

279 **Prostacyclins and Thromboxanes in Cardiovascular Disease** (10) Bailey

The synthesis of vasoactive products from essential fatty acids, and their inhibition by aspirin and other non-steroid anti-inflammatory drugs. 8-week elective periods.

280 **Role of High-Density Lipoprotein in Atherosclerotic Heart Disease** (10) Bailey

Functional capacity of high-density lipoprotein and its protective effects in atherosclerotic heart disease. 8-week elective periods.

281 **Research in Biochemistry of Carbohydrates and Enzymes** (10) B. Smith

Research in a problem already under investigation in the department or a project in related fields suggested by the student. 8-week elective periods.

282 **Research in Biochemistry of Lipid Metabolism and Transport** (10) Vahouny

Biochemical investigation of a clinical problem involving lipids of special interest to the student, or participation in existing research program in the department. 8-week elective periods.

283 **Research in Metabolic Regulation within the Heart** (10) Vahouny

Studies on metabolic regulation and effects of drugs. 8-week elective periods.

284 **Research in Cholesterol Absorption and Metabolism** (10) L.I. Gallo

Participation in departmental research program involving the mechanism and prevention of cholesterol absorption. 8-week elective periods.

286 **Research in Biochemistry and Molecular Biology of RNA Tumor Viruses or DNA Polymerases of Mammalian Cells** (10) R.C. Gallo†

Investigative work at the National Cancer Institute, NIH. 8-week elective periods or equivalent.

287 **Research on the Function of B_{12} Coenzymes in Cell Replication** (10) Walker

Research in a problem under investigation in the department. 8-week elective periods.

288 **Anti-Inflammatory Drugs in Experimental Atherosclerosis** (10) Bailey

A study of the repression of atherosclerotic plaque formation in experimental animals by aspirin, sulfinpyrazone, and other anti-platelet drugs. 8-week elective periods.

* An interdisciplinary course offered by the Physiology and Biochemistry Departments.

† Dr. R.C. Gallo is Senior Investigator at the National Cancer Institute.

290 **Extramural Biochemistry Elective** (arr.) **Staff**

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Research in Biochemistry** (arr.) **Staff**

For first- and second-year medical students and graduate students. Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**

(Fall and spring)

398 **Advanced Reading and Research** (arr.) **Staff**

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Child Health and Development

Chairman: R.H. Parrott

Associate Chairmen: F.C. Green *(Child Health Advocacy)*, D.W. Delaney *(House Staff and Medical Care)*, J.L. Todaro *(Student Affairs)*, J.G. Randolph *(Surgical Division)*

Directors of Divisions: C.A. Rigg *(Adolescent Medicine)*, W.A. Howard *(Allergy)*, F.C. Green *(Ambulatory Medicine)*, L.P. Scott *(Cardiology)*, M.L. Elgart *(Dermatology)*, W. Hung *(Endocrinology)*, D.W. Delaney *(General Medicine)*, S. Leikin *(Hematology)*, R. Chandra *(Anatomical Pathology)*, J.M. Hicks *(Clinical Laboratories)*, G.B. Avery *(Neonatology)*, S.A. Shelburne, Jr. *(Neurology)*, G.D. Eng *(Physical Medicine)*, R.J. Fink *(Pulmonary Medicine)*, J.H. Evans *(Psychiatry)*, W.J. McSweeney *(Radiology)*, B.S. Epstein *(Anesthesiology)*, F. Midgley *(Cardiovascular Surgery)*, J.G. Randolph *(General Surgery)*, T.H. Milhorat *(Neurosurgery)*, D.S. Friendly *(Ophthalmology)*, D.W. McKay *(Orthopaedics)*, B.M. Webb *(Otolaryngology)*, L.W. Thompson *(Plastic Surgery)*, A.B. Belman *(Urology)*

Professors J.P. Adams, R.P. Altman, G.B. Avery, C.U. Battle, A.B. Belman, R.M. Chanock, D.W. Delaney, S.A. Doxiadis *(Visiting)*, A.H. Einhorn, M.L. Elgart, G.D. Eng, F.C. Green, G.R. Herer, W. Hung, A.Z. Kapikian *(Research)*, S.L. Leikin, A.M. Margileth, D.W. McKay, W.J. McSweeney, T.H. Milhorat, J.D. Noshpitz, J.E. Ott, R.H. Parrott, L.W. Perry, J.G. Randolph, J.L. Rapoport *(Research)*, L.P. Scott III, S.A. Shelburne, Jr., J.B. Sidbury, Jr., R.M. Sly, J.M. Wiener

Clinical Professors S.L. Baker, Jr., S. Berman, A.B. Coleman, L. Cytryn, M. Feitel, W.A. Howard, J.J. McFarland, B. Olshaker, M.M. Parks, R.E. Rieger, S. Ross, M.F. Shore, J. Spurlock, W. Stark, B.M. Webb, S.I. Wolf

Professorial Lecturers M. Jenkins, J.A. Kenney, Jr., J.L. Sever

Associate Professors K.D. Anderson, G.P. August, G.W. Bailey, A.B. Barnet, C.D. Brandt *(Microbiology)*, R.S. Chandra, G.J. Cohen, B.S. Dunbar, M.C. Edwards, A.I. Fields, A.B. Fletcher, D.S. Friendly, F.M. Galioto, A.M. Glasgow, L.W. Greenberg, J.M.B. Hicks, P.R. Holbrook, R.E. Johnsonbaugh, H.W. Kim, R.P. Kurz, F.M. Midgley, N. Movassaghi, S.S. Nason, J.W. Oberman, T.H. Oh, M.N. Ozer *(Research)*, M.M. Platt, B.M. Potter, K. Ravenscroft, Jr., C.A. Rigg, W.J. Rodriguez, E.J. Ruley, S.R. Shapiro, J.A.L.S. Tam, M.H. Thein, L.W. Thompson, J.W.L. Todaro, M.R.D. Wolf

Adjunct Associate Professors R.B. Kielich, J.R. Puig, H.B. Richardson

Associate Clinical Professors G.A. Balfour, I.B. Bourne, P.C. Braunschwyler, J.L. Chamberlain III, G.G. Cochran, R. Evans III, M.J. Fischer, D.J. Fishman, J.J. Francis, M.S. Glatt, H.R. Gold, S.I. Greenspan, V.L. Guandolo, G.W. Hardman, Jr., K.L. Kaplan, C.E.J. Kimball, L. Lefkowitz, J.L. Levine, I. Mahdavi, J.R.S. Malkin, A.E. Marans, G.W. Mella, I.D. Milowe, A.J. Modlin, K.B. Nelson, B.H. Ong, F.A. Pedreira, P.T. Peebles, C.B. Robinowitz, M.E. Robinson, B.C. Straight, T.J. Sullivan, G.A. Tripp, P.F. Wohlford

Associate Professorial Lecturer M. Engel

Assistant Professors M.D. Abramowitz, V.A. Argumedo, I.S. Baron-Starke, H.W. Binder, E.G. Blumenthal, R.L.O. Boeckx, M.A. Borengasser, D.R. Brallier, I. Brook, G.J. Buffone, C.S. Camerini-Otero, L.A.A. Champion, M.J. Chang, V.W.C. Cheng, J.M. Ciaravella, Jr., B.A. Copeland, C.B. Feinstein, A.H. Ficker, R.J. Fink, R.S.K. Gluck, B. Guller *(Research)*, M.K. Hammock, R.S. Hannallah, E.W. Hein, G.S. Hirschman *(Research)*, S.P. Kapur, M.T. Karna, J.F. Kelleher, R.A. King, B.M. Koch, A.B. Livingood, N.C. Luban, M.G. MacDonald-Ginzburg, M.M. Malawer, B.J. Maron *(Research)*, W.A. McGill II, C.R. Mock, S.L. Murray, C.M. Naulty, D.W. Ochsenschlager, V.V. Ott, B.J. Peacock, M.M. Pollack, G.H. Reaman, R.B. Reif, K.N. Rosenbaum, U.E. Ruttimann *(Research)*, J.R. Salcedo, T.J. Silber, L.F. Sorkin, B.W. Tsai, J.D. Van Brakle, L.A. Vituland, M.I. Weissman, L.G Welborn, J.H. Wise

Assistant Clinical Professors D.G. Albert, M.S. Albert, S.C. Amiri, R.S. Bashian, L.M. Beard, M.E. Bravo, J.M. Burgin, I.M. Chatoor-Koch, C.L.C. Chisholm, R.H. Coleman, T.M. Connor, L.A. Cove, M.M. Davis, R.P. Dickey, E.C. Esber, M.L. Feldman, M.A.V. Fox, M.R.J. Fox, T. Frey, S.L. Friedman, A. Gaisin, A.P. Guarinello, G. Joseph, B.J. Landau, P.C. Latkin, M.E. Lederman, J.A. Lowe, H.A. Mangold, D.H. McKnew, Jr., H.M. Meagher, J.F. Morales, P.J. Nachajski, R.A. Nover J.F. O'Neill, M.R. Ortega, H. Plotsky, V.E. Powell, M.L. Renfield, C.A. Renschler, R.S. Rixse, C.A.B. Schuman, R.H. Schwartz, A.E. Schweitzer, B.A. Shaver, R.L. Steerman, A.H. Stein, F. Strassburger, A. Tantisunthorn, E.S. Taylor, A.R. Ugel, S.G Werner, C.J. Weyland, I.C. Williams, S.B.W. Wooten, A.B. Zients

Assistant Professorial Lecturer I.P. Weiss

Instructors M.J. Becker, J.L. Gaiter, S.H. Josephs, R.L. McDowell, Jr.

Adjunct Instructors E.A. Black, H.E.C. Millar

Clinical Instructors B.S. Bruner, R.D. Castro, S.J. Coleman, Jr., P.A. Coyne, G.W. Daisley, Jr., M.W. Datch, R.A. De Vine-Curcio, K.Z. Fowler, E.M. Hall, D.P. Hamburger, H.L. Kaftarian, S.S. Kessel, G.M. Korengold, P.R. Littleton, R.J. Mier, E.A.G. Pinder, M. Rokni, B.L. Short, K.O. Simrel, M.M.D. Smokvina, F.L. Stroud, J.A. Vander Walde, H.T. Vollero, M.G. Walten, Jr., D.A. Young

Special Lecturers J.H. Bayly, C.M. Berlin, J.D. Blake, J.A. Bottiglione, J.M. English III, E.J. Feroli, A.L. Knasel, M.I. Michael, M.I. Mones, E.G. Moses, M. Schuelein, C.J. Schulte III, I. Seiler, R.B. Shearin

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*303 **Pediatric Clerkship** (10) **Todaro**
Full-time, as part of resident team; ward rounds; work in out-patient department and specialty clinics under staff supervision; child psychiatry and child guidance, lectures, clinical conferences, grand rounds. Children's Hosp. (Annual, continuous 8-week rotation)

360 **Clinical Pediatrics Acting Internship: Adolescent Unit** (5) **Todaro**
4-week elective periods. Children's Hosp.

361 **Clinical Pediatrics Acting Internship: Infectious Diseases** (5) Todaro
4-week elective periods. Children's Hosp.

362 **Clinical Pediatrics Acting Internship: General Medicine** (5) Todaro
Children aged 2 months-3 years. 4-week elective periods. Children's Hosp.

363 **Clinical Pediatrics Acting Internship: Hematology, Pulmonary Medicine** (5) Todaro
Children aged 3 months-12 years. 4-week elective periods. Children's Hosp.

364 **Clinical Pediatrics Acting Internship: Out-Patient** (5) Todaro
4-week elective periods. Children's Hosp.

365 **Clinical Pediatrics Acting Internship** (5) Van Brakle
Ward and ambulatory services. Lectures, conferences, rounds. 4-week elective periods. Holy Cross Hosp.

371 **Pediatric Gastroenterology** (5) Todaro
In-patient and out-patient management of infants and children with gastrointestinal disease. Common procedures performed in gastroenterology (endoscopy, jejunal biopsy, liver biopsy, sigmoidoscopy). 4-week elective periods. Children's Hosp.

372 **Pediatric Out-Patient Medicine** (5) Cohen, Margileth
Diagnosis and management of common ambulatory problems under the supervision of an attending physician and senior resident. 4-week elective period. Children's Hosp.

373 **Pediatric Urology** (5) **Belman**
Participation in clinical approaches on an inpatient and outpatient basis. Assessment, diagnostic evaluation and the participation in surgical problems. 4-week elective periods. Children's Hosp.

* Required for medical students.

374 Pediatric Orthopaedic Surgery (5) McKay

4-week elective periods. Children's Hosp.

375 Pediatric Surgery (5) Randolph

Participation in an active, closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. 4-week elective periods. Children's Hosp.

376 Pediatric Neurology (5) Shelburne

Participation in diagnostic and therapeutic studies on inpatients and outpatients. Rounds, conferences, seminars. 4-week elective periods. Children's Hosp.

377 Community Health Development (5) Hinckley

Acquaintance with public health preventive and community medicine as it is conducted by the Montgomery County, Md., Health Department. Opportunity to work in outlying health centers and central pediatric specialty clinics. Familiarization with school health programs and projects. 4-week elective periods.

378 Genetics (5) Rosenbaum

Principles of basic human genetics with emphasis on the dysmorphic child, chromosomal aberrations and genetic counselling. Opportunity to work in the genetic laboratory and to learn chromosomal techniques. 4-week elective periods. Children's Hosp.

379 Pediatric Intensive Care (5) Holbrook, Fields, Pollack

Clinical and didactic material on the pathophysiology and treatment of life-threatening illnesses, conditions, or injuries in childhood. Limited patient responsibility, extensive patient contact. Night call arranged individually. 4-week elective periods. Children's Hosp.

381 Pediatric Allergy (5) Sly

Introduction to pediatric allergy; clinics and wards. Some experience in experimental techniques and preparation of extracts. 4-week elective periods. Children's Hosp.

382 Pediatric Radiology (5) McSweeney

Participation in conferences and observation in the department; conventional and newer non-conventional body imaging teachniques are stressed in problem solving in pediatric medicine. 4-week elective periods. Children's Hosp.

383 Pulmonary Medicine (5) Fink

Detailed diagnostic and therapeutic procedures including pulmonary and nutritional manifestations and complications in cystic fibrosis patients from the newborn to those in their third decade. Medical, surgical, psychological, and social problems of cystic fibrosis patients and their families. 4-week elective periods. Children's Hosp.

385 Child Psychiatry (5) Egan

Observation of and appropriate participation in diagnostic, consultative, and follow-up work with hospitalized children and psychiatric outpatients. Clinical and theoretical conferences. Orientation to community child psychiatry and child mental health as part of service delivery system. 4-week elective periods.

386 **Pediatric Hematology** (5) **Leikin**

Clinical and laboratory studies of infants and children with hematologic disorders; bone marrow examinations. 4-week elective periods. Children's Hosp.

387 **Clinical Pediatrics** (5) **Soto**

Care of newborn and children on inpatient basis; diagnostic studies, therapy; assigned reading. 4-week elective periods. Fairfax Hosp.

388 **Newborn Medicine** (5) **Avery, Fletcher**

Observation and participation in the intensive care of infants. 4-week elective periods. Children's Hosp.

389 **Pediatric Cardiology** (5) Scott, Perry

Physical diagnosis of congenital and acquired heart diseases, interpretation of electrocardiograms and vectorcardiograms, cardiac catherizations. 4-week elective periods. Children's Hosp.

390 **Extramural Pediatric Elective** (arr.)

The department makes arrangements for students to spend elective periods at other institutions. Interested students should contact Dr. Jane Todaro after they have obtained the following: (1) a letter of approval from the Dean for Academic Affairs, (2) a description of the course or courses to be taken, and (3) a description of the affiliations of the other institution.

392 **Adolescent Medicine** (5) Rigg, Silber

Outpatient clinical experience in diagnosis and management of problems of this age group, under supervision of senior staff and Fellows. Participation in consultative clinics, multidisciplinary interviewing conferences, medical teaching conferences, Adolescent Grand Rounds, and twice-weekly conferences with department chairmen. 4-week elective periods.

393 **Pediatric Anatomical Pathology and/or Clinical Pathology** (5) Chandra

Participation in necropsy and surgical pathology service. Clinical correlation of histopathology, laboratory studies, and clinical disease. 4-week elective periods. Children's Hosp.

394 **Pediatric Clinical Laboratory** (5) **Hicks**

Laboratory studies of infants and children correlated with clinical disease. In-depth review of laboratory diagnostic studies. 4-week elective periods. Children's Hosp.

395 **Pediatric Endocrinology and Metabolism** (5) Hung, August, Glasgow

Observation of evaluation of patients with endocrine and metabolic disorders. Participation in planning of diagnostic and therapeutic programs for patients in an office setting. 4-week elective periods. Children's Hosp.

396 **The Handicapped Child and Chronic Disease** (5) **Battle**

Care of the handicapped child in a clinical situation and through tutorial readings. 4-week elective periods. Hosp. for Sick Children.

397 **Pediatric Nephrology** (5) **Ruley**

Clinical nephrology, hemodialysis, and research opportunities in immunologic causes of renal disease, complement abnormalities, vitamin D metabolism, acid-base physiology, renal physiology, and calcium metabolism. 4-week elective periods. Children's Hosp.

398 **Comprehensive Care** (5) Oberm

Participating in both sick- and well-child care as administered in a co prehensive setting; experience in multidisciplinary approach; cooperati planning with other community agencies. 4-week elective periods. Compr hensive Health Care Program.

399 **Community Pediatrics** (5) Greenber

For students primarily interested in private pediatrics practice. Care i the nursery and pediatric ward of a community hospital; exposure t private pediatrics practice in an office setting. 4-week elective period Holy Cross Hosp.

Clinical Engineering

Chairman: W.S. Yamamoto

Professors H.V. Pipberger, W.S. Yamamoto
Adjunct Professors L.E. Lipkin, J.K. Weston
Professorial Lecturer B. Kemp
Associate Professors R.A. Dunn *(Research)*, H.F. Orthner
Assistant Professors W. Knaus, H.Z. Pipberger *(Research)*, J.R. Saklad

Staf

101 **Practical Computing for New Health Practitioners** (3)

For students majoring in radiologic science and administration. Designed to familiarize the student with computer systems, basic terminology, applications programming, and I/O equipment.

Staf

201 **Theory of Medicine** (1)

Required course for first-year medical students, covering selected topics in biostatistics, epidemiology, utility, decision theory as applicable to the practice of medicine. Examination of the epistemology of medicine.

Staf

351 **Clinical Engineering for Medical Students** (5)

Engineering technology as applied to medical problems. Students will be assigned for tutorial instruction in the principles and practices of clinical engineering. Participation in current laboratory projects, assigned reading and study. Minicomputer and microcomputer hardware applications. Elective for first-, second-, and fourth-year medical students. 4-week elective periods for seniors. Warwick Bldg.

Staf

353 **Medical Computing** (5)

Aspects of computer usage, including preparation and execution of programs which involve clinical or research applications such as ECG analysis, pulmonary function calculation, medical file management, mathematical modeling, data processing, and managerial computing. In some cases the staff may be able to supervise a student in an area of the student's choice; in general, however, the program will consist of classroom or laboratory instruction. Elective for first-, second-, and fourth-year medical students. 4-week elective periods for seniors. Warwick Bldg.

354 **Automated Medical Measurement Systems** (5) Staff

Under supervision, the student will work in a multiphasic screening clinic and participate in the process of new implementations and in evaluation of the system. Seminar discussion of variability in clinical findings, preventive medicine, and occupational medicine. 4-week elective periods. Warwick Bldg.

390 **Extramural Clinical Engineering Elective** (arr.) Staff

The department sponsors fourth-year students spending one or more elective periods at other institutions. Programs must have the prior approval of the department staff.

Dermatology

Chairman: M. Elgart

Professor **M. Elgart**
Clinical Professors C.S. Brown, T.P. Nigra
Professorial Lecturers S.K. Gottlieb, J.A. Kenney, Jr.
Associate Professors M. Braun III, M.L. Turner
Adjunct Associate Professor A. Kornhauser
Associate Clinical Professors P.L. Repetto, Jr., O.G. Rodman
Assistant Clinical Professors S.H. Berk, M. Chadab, L.D. Cutler, R.N. De Angelis, L.J. Eanet, A. Gaisin, H.S. Golomb, A.F. Hood, R.A. Katz, W.G. Klingler, D.E. Mitchell, A. Neimanis, D.L. Pierson, D.N. Robins, A.R. Ugel
Adjunct Instructor J.D. Smith, Jr.
Clinical Instructors D.R. Foster, G.H. Reichling

380 **Dermatology Clinic** (5) Turner

Conferences, lectures, and attendance at dermatology clinic where patients with wide variety of dermatoses are seen. Diagnosis and treatment of common skin disorders. Dermatologic surgical procedures, technique for using liquid nitrogen, culture and identification of fungi, microscopic diagnosis of common cutaneous diseases. 4-week elective periods. Med. Fac. Assoc.

381 **Dermatology Clinic** (5) Mitchell, Klingler, Reichling

Same as Derm 380. 4-week elective periods. Walter Reed Army Med. Cntr.

382 **Dermatology Clinic** (5) Rodman

Same as Derm 380. 4-week elective periods. Walter Reed Army Med. Cntr.

383 **Dermatology Clinic** (5) Neimanis

Same as Derm 380. 4-week elective periods. Andrews AFB Hosp.

385 **Dermatology in General Medicine** (5) Nigr
Dermatology as related to internal medicine. Mechanisms of diseases in-depth approach to dermatologic-medical problems; advanced reading 4-week elective periods. Wash. Hosp. Center.

386 **Private Office Practices** (5) Staf
4-week elective periods.

387 **Clinical Dermatology** (5) Fischman*
Introduction to clinical dermatology, by working in the out-patient dermatology clinic, observing in-patient consultations, reviewing histopathology performing skin biopsies. Close supervision by staff. Interview required 4-week elective periods. VA Hosp.

390 **Extramural Dermatology Elective** (arr.)
The department makes arrangements for students to spend 4-week elective periods at other institutions. Interested students should contact the chairman of the department.

Health Care Sciences

Chairman: J.E. Ott

Director of Division of Geriatric Medicine: V.A. Portnoi

Professors J. LaRosa, J.E. Ott, T.E. Piemme

Adjunct Professor S. Barchet

Clinical Professor A.B. Rosenbaum

Associate Professors G.W. Bailey, P.S. Birnbaum, R. Keimowitz, V.A. Portnoi, L.I. Sank, P.J. Steinglass

Adjunct Associate Professor F. Mullan

Associate Clinical Professors P. Birk, S.J.N. Sugar, W.J. Washington, Jr.

Associate Professorial Lecturer J.L. Falkson

Assistant Professors B.C. Blatt, W.G. Boren, L.K. Davies, M.S. Donaldson, S.S. Edelstein, D.S. Edge, N.Z. Einstein, D.A. Guida, J.K. Johnson, K.R. Katterjohn, N.W. Matheson *(Research)*, L.G. Pawlson, R.K. Riegelman, C.S. Shaffer, J.R. Shapiro, M.R. Silverman, K.R. Sorem, C.T. Spiegel, W.A. Stein, A.W. Stone, M.I. Weissman, D.S. Whitman, J.M. Wise

Adjunct Assistant Professors M.M. Belz, M.W. Smith

Assistant Clinical Professors B. Avrunin, R.A. Berenson, W.R. Ehrmantraut, S.F. Fiscina, E.F. Gottlieb, A.P. Guarinello, J.A. Harman, J.D. Hines, R.R. Honablue, Jr., C.S. Hyatt, J.P. Lucas, C.B. Mount, H.A. Pincus, G.M. Shumaik, H.J. Steinfeld

Assistant Professorial Lecturers C.J. Maas, J.K. Miller, S.E.H. Raviv, E.M. Taft

Instructors J.H.R. Cutler, J.M. Mitchell, R.F. Shesser

* Dr. Fischman is Chief of the Dermatology Service at the Veterans Administration Hospital.

Adjunct Instructors N.M. Hoover, J.H. Nicklason

Clinical Instructors S.R. Armstrong, J.C. Arnett, Jr., H.S. Brooks, D.T. Chua, N.T. Connally, E.B. Hume, H. Jackson, V.V. Kalbian, G.A. Logsdon, D.J. Lynn, V.T. Miller, J.A. Noronha, J.C. Noyes, R.G. Stevenson, Jr.

Special Lecturers R.W. Angel, L. Brodie, R.D. Cox, T.A. Greenwood, J.H. Lamkin, J.B. Laskowski, E.E. Leclerc, A.E. Randall, F.P. Scazzafavo, K.L. Thomas, M.T. Threatt

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Courses numbered from 10 through 96 are limited to military personnel in off-campus health sciences programs.

10 **Anatomy and Physiology** (3) Staff

Study of the human body: esteology, arthrology, myology, hematology, immunology; circulatory, respiratory, digestive, endocrine, excretory, nervous, and reproductive systems.

11 **Applied Anatomy and Physiology** (6) Staff

Application of anatomical and physiological principles. Control of hemorrhage, methods of resuscitation, management of shock, relief of pain; physical examination, nutrition, fluid and electrolyte balance, respiratory conditions, childbirth.

15 **Pharmacology and Toxicology** (5) Staff

Medicinal substances used in treating people: pharmaceutical mathematics, terminology, preparations, compounding, physiological action and potential toxic reactions of certain drugs, legal aspects of drug regulations.

16 **Clinical Laboratory Techniques and Procedures** (arr.) Staff

Laboratory procedures used in basic health maintenance. Use of microscope, complete blood count, acid-fast stain, urinalysis, blood sedimentation rate, RPR card test, coagulation and bleeding time, blood grouping, blood typing.

22 **Introduction to Epidemiology** (2) Staff

Study of common communicable diseases, immunologic factors, and procedures. Contact interviewing and reporting of the communicable diseases.

67 **Disaster Sanitation** (2) Staff

Survey of nuclear, biological, and chemical hazards; emphasis on detection, personnel protection, and related functions.

68 **Environmental Sanitation** (3) Staff

Study of certain environmental factors which contribute to human health. Food, water, living and working spaces, economics, and pest control.

92 **Medical Material Management** (3) Staff

Material management in the medical facility. Budget and budgeting process, expense operating budget, purchasing, material receipt and inspection, inventory of equipment and supplies, controlled medicinals, stock record cards, surveys and adjustments, classes of plant property, property accountability, storage requirements.

93 **Health Systems Administration I** (4) Staff

Health systems organization. General office procedures, basic typing methods, standard subject identification codes, filing procedures, records disposal, security of patient information, correspondence, procedural manuals.

94 Health Systems Administration II (4) Staff

Planning office systems, procedures, environment, and location. Quality control, work measurement methods, authority and organizational relationships, principles of office organization, employee supervision.

95 Records Management (6) Staff

Public health records management. Classification of personnel, personnel records, promotions, educational services, career development, personnel orientation, medical care eligibility, patient data systems, statistical analysis.

96 Clinical Experience (arr.) Staff

Supervised experience and research. Application of principles learned in didactic experience to the practical situation.

101 Environmental Biostatistics (3)

Statistical reasoning, collection of data, rates, incidence, and prevalence. Generalization of observations and use of measurement data. For off-campus students.

102 Food and Water Sanitation (4) Staff

General characteristics of urban and rural water systems, treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Dairy products and food sanitation. Processing, storing, and distributing food. Supervision and training of food industry personnel.

109 Human Behavior I (2) Staff

Introduction to psychiatric assessments and to ways of understanding and working with a variety of patients. Problem-solving techniques are emphasized through the use of conceptual models. (Fall)

110 Anatomy for New Health Practitioners (3) Staff

Gross and microscopic make-up of the human body and the major organ systems: cellular, musculoskeletal, nervous, endocrine, cardiovascular, respiratory, gastrointestinal, urinary, reproductive, and integrated. Knowledge of structure at the cellular level is used to develop understanding of the organization of the human body at tissue, organ, and organ system levels. Disease processes and clinical applications are considered. Laboratory work is limited to prosected anatomical demonstrations.

113 Physician's Assistant Seminar II (1) Staff

(Formerly Medicine and Society)

Continuation of HCS 119. Prerequisite: HCS 119. (Spring)

116 Medical Terminology (arr.) Davies

Terminology and vocabulary basic to all areas of medical science, hospital services, and allied health specialties. (Fall)

119 Physician's Assistant Seminar I (arr.) Staff

(Formerly Patient Care I)

Current topics of interest to the health care professional. The student will develop an understanding of his or her role in the health care system and how that role may be developed in the future. (Spring)

122 Public Health Microbiology (3)

General applied concepts of microbiology, fundamental immunologic con-

cepts, general principles of virology, development of a surveillance protocol for nosocomial infection. For off-campus students.

125–26 **Manifestations of Disease** (arr.) Staff

An intradisciplinary course presenting the pathologic and abnormal structure and function encountered in clinical disease states. A functional approach to clinical medicine, including sign symptoms and diagnosis of disease states. Prerequisite: HCS 110, 112; Phyl 111. (Spring)

127–28–29 **Clinical Medicine** (arr.)

Same as HCS 125–126. For off-campus students.

131 **Human Behavior II** (2) Staff

Continuation of HCS 109. Prerequisite: HCS 109. (Spring)

134 **Clinical Assessment** (2) Staff

(Formerly Patient Care II)

Clinical interviewing (or history taking), and physical examination, designed to permit the student to achieve a beginner's level of clinical competence, defined in terms of attitudes and behavior, clinical skills, and fundamental knowledge. (Fall)

137 **Issues in Health Care** (1) Pawlson

The focus of the course will be on the interface between the individual practitioner-patient interaction and the various forces of society which have a major impact on the practitioner and the patient. The contribution of law, ethics, economics, and government to the health care system will be introduced in lectures and panel discussions, and illustrated with case reports. (Spring)

140 **Clinical-Pathological Correlation** (0) Staff

Three hours a week for 8 weeks. Format for case presentations and proper method for clinical integration of signs and symptoms of disease. Prerequisite: HCS 116. (Spring)

142 **Nurse Practitioner Seminar I** (2) Silverman

Family dynamics, role resocialization, and current issues influencing development of the nurse practitioner role.

143 **Nurse Practitioner Seminar II** (3) Silverman

Continuation of HCS 142.

144 **Nurse Practitioner Seminar III** (1) Silverman

Continuation of HCS 142 and 143.

145 **Primary Care and Therapeutics** (3) Staff

Common office pediatric and adult medicine problems. Lectures, case presentations, and audiovisual presentations.

146 **Surgical and Diagnostic Procedures** (1) Staff

Fundamentals for performing several diagnostic and surgical procedures. Basics for preparation and execution of procedures such as venipuncture, suturing, intravenous infusion. Proper surgical decorum, development of working knowledge of various surgical instruments and sutures. (Spring)

147 Introduction to Radiology (1) Staff

(Formerly Radiology)

Emphasis on basic language, science, and principles of radiology, including such aspects as safety, positioning, protection-requesting studies, etc. Basic elements of topographic anatomy as applied to radiology. The differentiation of abnormal from normal on chest, abdominal, and extremity films. Basic pattern recognition along with a systematic approach to each x-ray interpretation. (Fall)

148 Introduction to Electrocardiography (1) Staff

(Formerly Electrocardiography)

Emphasis on the performance of a technically competent electrocardiogram by each student. Basic theory behind electrocardiography as well as interpretation of basic EKG patterns. Common errors of taking and reading EKGs. Identification of common normal and abnormal wave patterns on EKGs. Value and appropriate use of echocardiography and phonocardiography. Principles of performing simple exercise tolerance testing.

151 Clinical Pharmacology (1) Staff

Day-to-day clinical situations for discussion of the appropriate use of some of the more common drugs in a primary care practice. Dosages, actions, routes of administration, indications, and contraindications as applied to specific clinical examples. Advantages, disadvantages, and reasons for deciding on the primary drug and possible alternative therapy. When and how to use *PDR*. Review and discussion of the importance and advantages of taking an accurate and complete drug history. Prerequisite: Phar 158. (Summer)

153 Gynecology Outpatient: Nurse Practitioner (3) Staff

Three-week required rotation for nurse practitioner students. Management of gynecological problems in ambulatory setting.

154 Gerontology Practicum (arr.) Silverman

Elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

157 Primary Care Preceptorship: Nurse Practitioner (6) Staff

Six-week required rotation for nurse practitioner students. All aspects of patient management in ambulatory setting.

160 Medical Inpatient (5) Staff

Six-week rotation in which the student learns to recognize, collect, and integrate information regarding the medical problems of a hospitalized patient. The student works on the medical ward with a patient care team under the supervision of the medical resident and/or attending physician. Initial patient evaluation data base (history, physical, appropriate diagnostic and therapeutic procedures) and assistance with inpatient management. Daily rounds with emphasis on the basic approach to diagnosis, treatment pathophysiology, and prevention of disease. The Problem Oriented Medical Record System is used. Attendance is required at all work rounds, teaching rounds, noon conferences and grand rounds of the medical service. Students stand regular call status.

163 Medical Outpatient (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding various medical problems encountered in an ambulatory setting. Common ambulatory problems of

both acute and chronic nature. The student is assigned to an ambulatory setting such as outpatient clinic, HMO, or community health center. New patients are evaluated with staff assistance and follow-up visits are supervised by the staff. Emphasis on differential diagnosis, utilization of ambulatory facilities, patient management, and preventive medicine.

165 **Medical Outpatient: Nurse Practitioner** (ARR.) Staff

Required rotation for nurse practitioner students, arranged with approval of advisor. All aspects of patient management in ambulatory setting.

166 **Surgical Inpatient** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information relating to the surgical patient. Students are given in-depth experience in the pre-operative and post-operative management of the surgical inpatient; they are taught to perform a pre-operative workup, make progress notes, and participate in operative procedures under close supervision of the surgical staff. The student is also expected to stand call. Attendance by the student at all surgical rounds is mandatory.

167 **Surgical and Emergency Medicine** (ARR.) Staff

Same as HCS 178 except that length of course is variable. For off-campus students.

169 **Obstetrics and Gynecology** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding the obstetrical and gynecological patient. Students work up and follow patients on the obstetrical and gynecological service, and assist in deliveries and gynecologic/obstetric procedures. Students attend all regularly scheduled obstetric and gynecologic ward rounds, conferences, and seminars conducted by the staff.

170 **Obstetrics: Nurse Practitioner** (2) Staff

Two-week elective rotation for nurse practitioner students. With guidance and approval of advisor, students develop individual study and learning objectives.

171 **Pediatric Outpatient: Nurse Practitioner** (3) Staff

Three-week rotation for nurse practitioner students. Ambulatory pediatric practice.

172 **Pediatric Outpatient** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding medical problems of the pediatric outpatient. Students are assigned to a pediatric outpatient setting under the direction of a physician where they learn normal childhood development, history-taking, and physical examination of infants and children. The student also develops skills in the management of common childhood illnesses and in parental counseling.

175 **Primary Care Preceptorship** (ARR.) Staff

Required rotation for allied health students. All aspects of primary care medicine. Hospital rounds with attending physicians.

178 **Emergency Medicine** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding the emergency patient. Students have rotation shifts to ensure maximum exposure to patient load and clini-

cal experience. Opportunity to deal with a variety of acute life-threatening, traumatic, and psychiatric emergencies. Surgical and medical emergency management problems under the supervision of the emergency room physicians. Attendance is required at all applicable conferences.

179 **Emergency Medicine: Nurse Practitioner** (2) Staff

Two-week rotation required for nurse practitioner students. Medical and surgical emergency management problems.

180 **Practicum in Environmental Health** (10) Staff

Supervised fieldwork. Food service, housing, water, sewage and solid waste, and infectious diseases. Occupational health problems. Reports and conferences.

181–82 **Introduction to Environmental Science** (3–3)

Water: general characteristics (urban and rural), treatment and distribution, public bathing place sanitation, design and function of water treatment facilities. Recognition and control of environmental pollution. Treatment and disposal of human wastes. Food sanitation: processing, storage, and distribution. Effects of major pollutants on people. Radiological safety. For off-campus students.

183 **Introduction to Industrial Hygiene** (3)

Chemical hazards: diseases caused by chemical exposure, toxic dust, metal fumes and vapor, gases and organic compounds. Physical hazards: biological effects of low and high temperatures, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure and atmospheric pollution. For off-campus students.

184 **Public Health Organization and Administration** (3)

Public health activities and organization, philosophy, background, and development. Vital statistics, laboratory services, education, nursing, and social services. Administrative considerations, including governmental aspects, fiscal management, personnel factors, and public relations in public health organizations. For off-campus students.

185 **Environmental Impact and the Law** (3)

The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment. For off-campus students.

189 **Alcohol Rehabilitation Unit** (3)

Psychological and therapeutic approaches to care and rehabilitation of patients with alcohol-related disturbances. For off-campus students.

190 **Dermatology** (1)

Clinical assessment of common dermatologic conditions found in the ambulatory care setting. For off-campus students.

191 **Eye, Ear, Nose and Throat** (3)

Diagnostic and therapeutic approaches to determining the prognosis and outcomes of disease of the eyes, ears, nose, and throat. For off-campus students.

192 **Orthopaedics** (3)

Diagnosis and treatment of common orthopaedic problems found in the primary care setting. For off-campus students.

193 **Issues in Aging** (3) Boren

Seminar on the nature and problems of aging, including social, biological, economic, legal, and health care needs. Guest lecturers include professors from several University schools and experts from affiliated institutions and the community. Designed primarily for graduate students in the social sciences and health care administration and for students in the medical school. (Fall and spring)

194 **Practicum in Gerontology and Geriatric Care** (arr.) Staff

Supervised fieldwork with the elderly or in administration and planning for the elderly. Offered in cooperation with other schools and departments of the University. Primarily for undergraduate and graduate students in the social sciences and health care administration, and for students in the medical school pursuing the B.S. with a concentration in gerontology degree. Open to others with departmental approval. (Fall and spring)

196 **Issues in American Health Care** (arr.) Lynn

Fieldwork combined with academic study of the present American health care system and its problems: cost, quality of care, delivery of care, ethical issues, health education, consumer issues. Field placements (12–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

197 **Community Health Education** (3)

An overview of theory and practice related to community health education. Concentration on factors promoting individual and community participation in maintaining and improving health. For off-campus students.

198 **Psychiatry** (5) Staff

Six-week required rotation in which the student learns to recognize, collect, and integrate information regarding the psychiatric inpatient. Identification and management of psychiatric illness. Teaching rounds, small group seminars, and grand rounds provide instruction in psychopathology and treatment methods. As an integral part of the treatment team, the student participates in the care of the psychiatric patient, working closely with the faculty, learning to elicit information from the patient and his family, and interpreting findings.

199 **Independent Study** (arr.) Staff

Clinical rotation in area chosen by individual student. Objectives for chosen area determined before enrollment. Advisor's approval required for area of study and learning objectives.

230 **Emergency Medicine I** (1)

Required course for first-year medical students. Didactic presentations by guest speakers on general principles in the pre-hospital care and handling of victims of accident and illness. Emphasis on pre-hospital management of typical emergencies. Patient assessment, cardio-pulmonary resuscitation, bandaging and splinting, lifts and carries, intravenous therapy and parenteral drug administration. Opportunities to practice psychomotor skills and rescue techniques during regularly scheduled practicum sessions. (Spring)

231 **Emergency Medicine II**

Elective continuation of HCS 230. The student is expected to develop proficiency equivalent to that of an emergency medical technician. Opportu-

nities to spend time in the University Emergency Room and ride on either a basic life support ambulance or mobile intensive care unit with the instructor. After successful completion of Emergency Medicine I and II, the student is awarded an Emergency Medical Technician certificate by the University.

Staff

301 Clerkship in Primary Care (10)

Required for third-year medical students. Care of patients in ambulatory setting. Includes participation in University's prepaid health plan (HMO), emergency room, and office practice of general internists, general pediatricians, and family practitioners. Emphasis on specialty skills which contribute to physician's capacity to care for common minor illnesses. Office practice of orthopaedics, otolaryngology, dermatology, and ophthalmology. Participation with District of Columbia Fire Department in responding to ambulance calls. Lecture series provides foundation for office management of common illnesses in ambulatory setting. 8-week elective periods throughout the academic year.

Pawlson

350 Ambulatory Health Care (5)

For senior medical students. Research or clinical experience in primary medical care. Participation in project relating to health care delivery, including medical audit, organization of health services, and problems of underserved populations. Exchange with similar program in other institutions is possible, especially for those participating in model family practice units. 4-week elective periods.

Parker

359 Emergency Health Care (5)

For senior medical students. Instruction by full-time and resident emergency room staff. Course will emphasize cardiopulmonary resuscitation and management of trauma, drug overdose, coma, and common illnesses and injuries in the emergency care setting. 4-week elective periods. Greater Laurel-Beltsville Hosp.

Parker

360 Emergency Health Care (5)

For senior medical students. Assignment to an emergency room in the District of Columbia. Instruction by full-time and resident emergency-room staff. Emphasizes cardio-pulmonary resuscitation and management of trauma, drug overdose, coma, and common illnesses and injuries in emergency care setting. 4-week elective periods. Limited to two students per period.

361 Family Practice Preceptorship (5)

Students spend four to eight weeks in a family practice preceptorship in rural Garrett County, Maryland. Supervision is by board-certified family practitioners in the Garrett County Medical Center. The physicians are affiliated with the University of Maryland Family Practice Program of which this site is a part.

Pawlson

362 Rural Family Practice Preceptorship (5)

Family health care in a small coal mining town in central West Virginia. The Somersville Hospital Family Practice Center includes facilities for outpatient, inpatient, and emergency services. Supervision is by three board-certified family practitioners. 4-week elective periods.

369 Issues in Health Care (1)

The focus of the course will be on the interface between the individual practitioner-patient interaction and the various forces of society which

have a major impact on the practitioner and the patient. The contribution of law, ethics, economics, and government to the health care system will be introduced in lectures and panel discussions, and illustrated with case reports. Required for second-year medical students.

370 **Mental Health Provision in the Primary Care Setting** (5) Shapiro

For senior medical students who seek clinical experience in a multi-disciplinary mental health practice, with emphasis on the short-term treatment of patients commonly presenting in a primary care setting. Students are exposed to such problems as sexual dysfunction, depression, and psychosomatic symptoms as they are presented in an ambulatory care setting. The student is given the opportunity to perform initial evaluations, observe groups, follow patients, and provide consultation to primary care teams. Limited to one student per session for a minimum 6-week elective period.

390 **Extramural Health Care Sciences Elective** (arr.)

The department makes arrangements for students to spend one or more elective periods at other institutions. Approval of the department chairman required.

Interdisciplinary Courses

First-year medical students are required to take Idis 212 *Neurobiology*, administered by the Departments of Anatomy and Physiology.

212 **Neurobiology** (5) **Staff**

Same as Anat 212 and Phyl 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory.

Introduction to Clinical Sciences, an interdisciplinary program, is required of medical students in the second year. By means of lectures, panel discussions, seminars, case presentations, demonstrations, and examinations of patients, it provides students with basic instruction in various clinical subjects and prepares them professionally and personally for the clinical clerkships and career electives in the third and fourth years. The program is coordinated by a task force appointed by the Committee on Educational Policy of the School of Medicine and Health Sciences. The task force consists of representatives from the departments responsible for teaching courses in the program: Anne Thompson, Department of Medicine; James Straw, Department of Pharmacology; Winfield Scott, Dean's Office; Frank Miller, Department of Pathology *(Chairman)*; Cheryl Dunn, Department of Psychiatry and Behavioral Sciences; and Tara O'Toole, second-year student. In addition to Idis 301 (see below), the program consists of Path 201, Phar 201, HCS 137, and Pchi 201.

301 **Introduction to Clinical Medicine** (16) **Staff**

One-year course. Integrated, organ-oriented course. Fundamental instruction in anesthesiology, child health and development, dermatology, gynecology, internal medicine, neurology, obstetrics, ophthalmology, psychiatry, radiology, and surgery; emphasis on physical diagnosis.

Medical and Public Affairs

Chairman: M. Head

Professors M. Head, D.J. Sharpe

Associate Professors F.J. Kavanaugh *(Research)*, E. Waters, Jr. *(Research)*

351 **Law and Medicine** (2) Sharpe, Head, Fiscu

Open to 2nd-year medical students. Problems arising when the professio
al interests of lawyers and physicians overlap. Malpractice, personal injur
litigation, licensure and discipline, ethics and economics, hospitals an
other institutions, and compelled treatment. (Spring)

Medicine

Chairman: J.C. Rios

Directors of Divisions: H.E. Ratcliffe *(Allergy)*, A.M. Ross *(Cardiology)*, A.J.
Ginsberg *(Gastroenterology)*, L.S. Lessin *(Hermatology-Oncology)*, C.U.
Tuazon *(Infectious Diseases)*, K. Wipplinger *(Internal Medicine)*, K.L. Becke
(Metabolic and Endocine Diseases), S.V. Spagnolo *(Pulmonary Diseases)*, I.G.
Tamagna *(Rehabilitation Medicine)*, A.M. Thompson *(Renal Diseases)*, R.F.
Jacobs *(Rheumatology)*

Professors J.M. Bacos, W.P. Baker, W.F. Barth, K.L. Becker, L. Bernstein
D.O. Castell, T.O. Cheng, J.A. Curtin, V.T. DeVita, G.D. Eng, J.M. Evans
J.D. Finkelstein, W.P. Fortune, D. Hawkins *(Research)*, A.C. Hollinshea
(Research—Pharmacology), I.I. Hsu, R.P. Kaufman, J.A. Kelser, Jr., P.D.
Kind, N.C. Kramer, J.C. LaRosa, F. Leonard *(Research—Rehabilitation*
Medicine), L.S. Lessin, J. Lindsay, Jr., W.M. Lukash, F.M. Muggia, A.I.
Parrish, T.E. Piemme, L.E. Pierce, H.E. Ratcliffe, R.C. Reba, D. Reis
J.C. Rios, M.J. Romansky, A.M. Ross, E.R. Simon, I.G. Tamagna, C.S.
Tidball, P. Witorsch, F.W. Wolff, H.J. Zimmerman

Adjunct Professors J.S. Borer, T.E. Morgan, J.P. Naughton, V.L. Nickel

Clinical Professors E. Adelson, A. Baer, S.H. Danovitch, H.D. Ecker, F.
Ennis, F.A. Finnerty, Jr., M. Fuchs, R. Goldman, T.J. Greenwalt, M. G
sack, H.L. Kamenetz, S.D. Loube, F.J. Murray, B. Nelson, E.P. Parker II
J.J. Rheingold, A.B. Rosenbaum, T.S. Sappington, H.M. Silver, M.H. Stol
C.W. Thompson, N.P. Trujillo, M.S. Wolfe

Professorial Lecturers S.M. Fox III, D.S. Fredrickson, H.A. McAllister, W.
Roberts *(Cardiology and Pathology)*

Associate Professors P.M. Berkman, M. Braun III, W.S. Chiu, M.H. Cohe
P. Cohen, D.W. Dew *(Research)*, W.R. Felts, Jr., B.E. Fossieck, Jr., J.
Gaskin, A.L. Ginsberg, M.S. Gold, K. Goldstein, P.A. Gorman, R.P. Jacob
R.I. Keimowitz, P.P. Klug, C.W. Linebaugh *(Research)*, K. Mallik *(Researc*
J.M.B. O'Connell, D.S. O'Leary, G.P. Schechter, W.H. Scott, S.V. Spagno
A.M.S. Thompson, C.U. Tuazon, P.J. Varghese, D.M. Watkin, K. Wi
plinger, J.E. Zimmerman

Adjunct Associate Professors W.T. Friedewald, E.A. Jones, L.W. Marshall

Associate Clinical Professors B. Arling, W.O. Bailey, Jr., L.F. Barker, S.E. Barr, G.S. Belaval, R.B. Benedict, P. Birk, W.D. Brill, J.B. Calatayud, A.W. Danish, O.W. Donnelly, D. Ein, R. Evans III, J. Fenton, R.A. Fischer, B.J. Gershen, R.A. Goldstein, B. Grand, A. Guha, R. Haider, M.J. Halberstam, L.B. Hobson, P.V. Holland, M.H. Jacobson, C.W. Jones, R.M. Kaufman, I. Kessler, J.D.B. King, S.W. Kirstein, J. Kleh, J.W. Latimer, Jr., A.A. Lear, E.J. Leonard, J.P. Mann, J.F. Mermel, J.F. Meyer, H.S. Mirsky, A.M. Mondzac, H.A. Moskovitz, G.H. Nachnani, M.A. Newman, D.A. O'Kieffe, J.M. Pisani, M.H. Rosenberg, D.R. Rosing, A. Ruskin, H.C. Sadin, R.K. Sarin, R. Scalettar, P. Schlein, C.A. Schulman, S.F. Seides, A. Seltzer, J.R. Shapiro, D.B. Simon, R.B.W. Smith, R.L. Standard, M.J. Stern, S.J. Talpers, L.J. Thomas, I.N. Tublin, J.W. Walsh, L.M. Weiss, G.R.G. Werth, R.S. Wilkinson, S.J.Wolin

Assistant Professors A.N. Amigable, M.A. Aradye *(Research)*, B.C. Blatt, L.D. Bohan, D.G. Borenstein, K.H. Chase, F.H. Corcoran, M.D. Delaney, S. Dosa, M.J. Drass, D.S. Edge, N.Z. Einstein, M. Enders, D.E. Fleischer, E.C. Flores, D.F. Fragnul, B.J. Gaffney, D.B. Gail *(Research)*, R.D. Gaskins, L.P. Georges, R.J. Katz, W. Kurland, T.V. Kuzmowych, R.F. Levine, C.S. Levy, N.W. Lindenmuth, A. Lipson, E.A. Lopez, Jr. *(Research)*, A.E. Medinger, S.H. Mendelson, R.A. Muesing *(Research)*, M.A. Parker, L.G. Pawlson, E. Perlin, L.H. Pierce, Jr., J.M. Raver, R.K. Riegelman, P.K. Rohatgi, R.C. Saunders, S.J. Scott, Jr., O.L. Silva, C.T. Spiegel, A.W. Stone, R.J. Warchol, A.G. Wasserman, D.S. Whitman

Assistant Clinical Professors C.B. Abrams, I.H. Ardam, P. Assatourians, S.M. Babin, H.S.B. Baraf, E.A. Beeman, L.F. Bentolila, R.A. Berenson, S.H. Berk, L.H. Biben, C.J. Bier, T.K. Bowers, B.L. Burka, H.D. Capone, P.P.L. Chang, F. Chucker, M.I. Cinnamon, R.F. Cioffi, J. Crowell, G.B. Cushner, R.A. Di Gioia, K.J. Dickie, T.P. Dwyer, R.F. Dyer, G.T. Economos, W.R. Ehrmantraut, N.E.S. Falk, M.H.W. Fang, L.H. Fenton, S.M. Fidler, A. Frank, S.B. Fredd, A.A. Friedman, S.D. Goldberg, S.G. Goldberger, H.S. Goldstein, W.Y.K. Goo, D.H. Goodman, L.D. Green, R.E. Greenspan, A.H. Grollman, P.A. Haber, J.T. Hagenbucher, D.J. Hand, F.K. Harris II, T.L. Hartman, W.H. Harvey, M.J. Haut, T.C. Havell II, B.A. Heckman, M.A. Herman, D. Horwitz, S.H. Houseman, S.K. Irani, J.A. Kark, R.J. Karpick, N. Kirmani, B. Kotelanski, W. Kurstin, P.C. Latkin, P.H. Levine, A.G. Levy, J.W. Long, J.P. Lucas, M.S. Maillis, B.L. Manalo, D.C. Marcus, B.A.M. Meyers, F. Meyers, M. Mohamadi, J.C. Mulhauser, R.A. Nicklas, A.A. Nimetz, R.A. Noble, A.A. Oboler, J.A. Ocuin, G.M. Orr, R.J. Osheroff, B.H. Ostrow, N.S. Otchin, S.W. Park, M.M. Phillips, G.N. Polis, P.W. Poth, J.S. Putnam, B. Rabkin, D. Ramaswamy, J.N. Ramey, S.N. Richman, D.N. Robins, J.D. Robinson, M.H. Rose, A. Rotsztain, N.H. Rubenstein, C. Rudzki, F.M. Ryan, P.B. Scherer, R. Schoenfeld, S.A. Schwartz, A. Segal, J.C. Seymour, A.B. Shauer, M.N. Shefferman, B.E. Sherwin, T.G. Sinderson, B.K. Singh, M.A. Sislen, J.T. Solano, I. Spector, M. Stock, J.M. Taubin, E.B. Thompson, G.J. Thorpe, R.W. Turner, G.W. Ward, Jr., D.H. Waterman, I. Weiszer, A.L.B. Williams, L.A. Wisneski, K. Yeung, D. Yoo

Assistant Professorial Lecturer C.D. Furberg

Instructors A.G.S. Fry *(Research)*, J.M. Mitchell, J. Rosenberg, R.F. Schesser

Clinical Instructors H.J. Alpert, L.P. Appel, C.L. Bender, B. Choi, N.T. Con
nally, N.A. Crane, D.W. Datlow, R.L. Ellis, N. Gonzalez, N.G. Goodman
H. Gordon, R.M. Huffman, P.W. Johnson, M.A. Kavalier, M.R. Kendall
R. Kramer, A.S. Lai, B.A. Lowen, D.J. Lynn, I.V. Magal, N. Mendjuk, V.T
Miller, D.E. Millon, J.C. Perkins, S.E. Pomerantz, S.R. Rishi, P.S. Spiegler
R.S. Waldman

Special Lecturers B.W. Janicki, S. Katz

Chas

250 **Introduction to Occupational and Environmental Medicine** (2)

Health effects of various occupational and environmental hazards an
pollutants discussed from several perspectives, including basic research
federal regulation, labor/management, and the physician. Health effect
of radiation, air and water pollution, toxic substances, and environmenta
extremes. Limited enrollment.

Staff

•305 **Inpatient Clerkship** (10)

Comprehensive study of patients; history and physical examination; ward
rounds, consultations, conferences, preceptorial teaching, seminars. V.A.
and Univ. Hosps., and Wash. Hosp. Center. (8-week periods through-
out academic year)

308 **Outpatient Medicine and Emergency Room** (10)

Care of ambulatory patients and emergency cases under close supervision
Daily clinics in general medicine and various specialties; conferences on
current cases. 8-week elective periods.

LaRosa

331 **Acting Internship in Medicine (Hematology-Oncology)** (5)

Assignment to a ward team dealing exclusively with patients with on
cologic problems. Many patients will be on chemotherapy protocols and
all will be seriously ill and in need of considerable special attention. Spec
ial conferences and regular house staff conferences. Students will take
night call with the ward team and will be expected to function at the
level of interns on the team. 4-week periods. Univ. Hosp.

LaRosa

332 **Acting Internship in Medicine** (5)

Responsibility at the intern level. Initial patient evaluation and diagnosti
and therapeutic plans, writing all medical orders (which must be counter
signed by an M.D.), coordinating patients' care, writing progress notes
and dictating the discharge summary. Night call with the ward team
House staff conferences. 4-week periods.

Curtis

333 **Acting Intern in Medicine** (5)

Under the supervision of the medical resident and attending physician
student works with a patient-care team on a medical ward, does initia
evaluation, and presents patient's problem at attending rounds and appro
priate teaching conferences. Subspecialty consultations also review patient
problem with the student. 4-week elective periods. Wash. Hosp. Cen
ter.

Finkelstei

334 **Acting Intern in Medicine** (5)

Students assigned to a patient-care team under direct supervision of
University resident on general medical wards. Problem Oriented Medic
Record System used. Students complete initial patient evaluation da

• Required for medical students.

base and are responsible for clinical management during hospitalization. They write all orders, which must be reviewed and co-signed by the resident, and are expected to present their patients at attending rounds and conferences. Close supervision and guidance by the team resident, attending physician, and subspecialty consultants. Interview required. 4-week elective periods. V.A. Hosp.

335 **Acting Intern in Medicine** (5) Wisneski

Responsibilities of intern. Similar to Med 332. 4-week elective periods. Holy Cross Hosp.

336 **Intensive Care Medicine** (5) Witorsch

4-week elective periods. Wash. Hosp. Center.

338 **Occupational and Environmental Medicine** (5) Chase

Students select a field setting in Washington area (AMTRAK, EPA, DC Fire/Police Depts., Navy Diving School, etc.) in which the effects of various occupational and environmental health hazards are addressed. Participation in administrative and clinical intervention is provided under direct physician's supervision. Emphasis on the relationship of occupational and environmental medicine to the practice of primary care. Travel opportunity to distant field sites is generally available. 4-week elective periods.

349 **Infectious Diseases** (5) Curtin and Levy

Clinical experience in infectious disease service. Daily work rounds including lab, conferences, Journal Club. 4-week elective periods. Wash. Hosp. Center.

350 **Clinical Infectious Diseases** (5) Parker

Fundamental concepts in the diagnosis and treatment of bacterial, viral, fungal, and mycobacterial infections. Students take primary responsibility in observing consultations; familiarization with advantages and limitations of laboratory techniques used to diagnose and manage infectious disease problems. Review of consultations seen by students by resident and full-time faculty members. Introduction to hospital infection surveillance program. 4-week elective periods. V.A. Hosp.

351 **Clinical Infectious Diseases** (5) Tuazon

Clinically relevant aspects of microbiology and immunology; relevant aspects of patient history, physical and laboratory examinations. Students will learn to do infectious disease consultations and to use antibiotics intelligently. Minimum 4-week clinical rotation. Students electing a longer time period will assist with research project in infections in drug abusers, staphylococcal infections (especially endocarditis), clinical pharmacology of gentamicin or mechanisms of immunity in sickle cell anemia patients. Univ. Clinic.

352 **Clinical Cardiology** (10) Hsu and Staff

Designed to provide experience in ambulatory and hospitalized patient care, ECGs, graphics, CCU, exercise lab; observation in cath lab and participation in hypertensive research clinic. 8-week elective periods.

353 **Clinical Cardiology** (10) Manchester

Observation of and participation in the diagnosis and clinical management of cardiovascular disorders. Acquaintance with physical signs of heart disease. Exposure to noninvasive diagnostic procedures, echo-, phono-, apex-cardiography; interpretation of electrocardiograms and chest x-rays; ward rounds in intensive coronary care unit. 8-week elective periods.

354 **Preceptorship in Cardiology** (5) — Ross

Placement with practicing cardiologists in office and hospital settings. 4-week elective periods.

358 **Clinical Cardiology** (5) — Bacos, Mendelson, Lindsay, Rosenberg, Goldstein

Bedside evaluation correlated with electrocardiography, stress testing, echocardiography, cardiac catheterization, nuclear studies, etc. 4-week elective periods. Wash. Hosp. Center.

359 **Coronary Care Unit** (5) — Bacos, Mendelson, Lindsay, Rosenberg, Goldstein

Emphasis on diagnosis and treatment of coronary disease, complications of infarction, diagnosis and treatment of arrhythmias, and selection of patients for surgical intervention. 4-week elective periods. Wash. Hosp. Center.

360 **Clinical Cardiology** (5) — Fletcher*

Experience in clinical cardiovascular problems under supervision of cardiology staff. Emphasis on history, physical diagnosis, and noninvasive cardiovascular techniques. Role of cardiac catheterization explained and results in specific cases discussed. Electrocardiography covered as one of the tools used to approach the cardiovascular patient. Patient management is integral part of course. Teaching rounds and conferences. 4-week elective periods. V.A. Hosp.

363 **Cardiac and Medical Intensive Care** (5) — Saunders†

Students take call every third night with a resident/intern team. All aspects of coronary care: special techniques of the unit, cardioversion, pacemakers, right-heart catheterization, intra-aortic balloon counterpulsation and ventilators. Other non-cardiac medical emergencies in critically ill patients. 4-week elective periods. V.A. Hosp.

364 **Cardiovascular Data Processing** (5) — Pipberger

Study of a variety of modern computer techniques; primary research in computer analysis of electrocardiograms. 4-week elective periods. V.A. Hosp.

365 **Clinical Electrocardiography and ECG Computer Analysis** (5) — Pipberger

Participation in daily computer processing and analysis of all electrocardiograms from two V.A. hospitals and Children's Hospital. ECG findings correlated with clinical data from all problem cases. Daily review sessions with section chief and cardiac fellows. Participation in weekly seminars and a Journal Club. 4-week elective periods. V.A. Hosp.

371 **Endocrinology** (5) — Gaskin

Student evaluates patients referred to the endocrinology service, takes part in planning diagnostic work-ups or therapy programs, and is responsible for case presentations and follow-up. Clinical rounds are held daily, and endocrine clinic and diabetic clinic are held weekly. The endocrine conference includes Journal Club once a month and pediatric endocrinology at

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* Dr. Fletcher is Chief of Cardiology at the Veterans Administration Hospital.
† Dr. Saunders is Assistant Chief of Medicine for Intensive Care at the Veterans Administration Hospital.

Children's Hospital once a month. Rounds and conferences at the V.A. and at G.W. Hospitals are included when possible. 4-week elective periods. Wash. Hosp. Center.

373 **Endocrinology and Metabolism** (5) Becker

Clinical experience in endocrinology and metabolism. Students examine endocrine patients, make preliminary diagnoses, and assist in treatment. Clinical rounds daily; weekly endocrine clinic, diabetic clinic, and Journal Club participation; laboratory and research experience available. 4-week elective periods. V.A. and Univ. Hosps.

375 **Endocrinology Research** (10) Becker and Staff

Participation in endocrinology and metabolism research laboratory. Introduction to chemical and technical aspects of endocrine research. Participation in ongoing research activities. Students learn appropriate procedures, such as radioimmunoassay of hormones, histopathologic technics, atomic absorption spectrophotometry, and investigative approach to solving research problems. Prior interview with instructor suggested. 8-week elective periods. V.A. Hosp.

376 **Metabolic Disorders in Diabetes** (5) Penhos

Intensive and practical studies of the technique to examine surgical, chemical, and hormonal diabetes. Participation in research on carbohydrate, protein, and lipid metabolism, insulin secretion in isolated organ perfusions. Seminars and participation in Journal Club; discussions on the results obtained. 4-week elective periods. V.A. Hosp.

381 **Research in Endocrinology** (5) Penhos

Participation in endocrine research, including laboratory experience, experimental surgery, biochemical methods, and *in vivo* and *in vitro* endocrine studies. Weekly seminars and discussions correlate experimental results with clinical observations. 4-week elective periods. V.A. Hosp.

390 **Extramural Internal Medicine Elective** (arr.)

The department arranges for students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

391 **Clinical Oncology** (5 or 10) Cohen

Participation in clinical management of patients with carcinoma on the Nat'l Cancer Institute-V.A. Med. Cntr. oncology ward. 4- or 8-week elective periods. V.A. Hosp.

393 **Medical Oncology** (10) Young

Current methods of evaluation and treatment of lymphomas, Hodgkin's disease, testicular tumors, ovarian, breast, and other malignancies, including a view of the broad spectrum of these diseases. Participation in patient care and review of clinical trials. Procedures such as bone marrows, liver biopsies, and other staging techniques. 8-week elective periods.

396 **Clinical Pharmacology** (15) Wolff

Introduction to clinical pharmacology and toxicology as the basis of the regulatory work of the Food and Drug Administration. Collaboration with a team of scientists reviewing investigational new drug applications with a drug experience reporting system, and with annual reviews of drugs in specific areas, emphasizing study of the benefit/risk ratio. Project work in a toxicology laboratory. Interview required. 12-week elective periods. Bureau of Drugs, FDA.

402 Research in Cancer Immunology (10) Hollinshead

Laboratory experience with tests used to correlate cellular anti-tumor reactivity to solid tumors with the clinical course of the disease; experiments to investigate viral etiology of certain forms of cancer; study of fetal antigens and role in oncogenesis; cell membrane antigens specific for leukemia. 8-week elective periods. Ross Hall.

412 Clinical Gastroenterology (5) Danish

Work in a suburban office devoted to private partnership practice of internal medicine with emphasis on gastroenterology. Hospital rounds, evaluation of problems, discussion with attending physician and patient of diagnosis and therapy, observation of and assistance in specialized procedures, practical aspects of office management. 4-week elective periods.

413 Clinical Gastroenterology-Hepatology (5) Dobbins

Intensive clinical experience with patients who have digestive diseases, including those of the gastrointestinal tract, liver, and pancreas. Patient consultations, teaching rounds, seminars. Joint conferences with surgery, pathology, and radiology staffs emphasize multidisciplinary approach to digestive diseases. 4-week elective periods. Univ. Clinic.

414 Clinical Gastroenterology-Hepatology (5)

Students see patients referred to the gastroenterology-hepatology section for consultation and are responsible for initial evaluation and the follow-up of these patients. Participation in all specialized procedures, including various biopsy techniques and endoscopies. Teaching rounds, conferences, seminars. 4-week elective periods. V.A. Hosp.

415 Clinical Gastroenterology (5) Gold

Course includes direct patient contact on a consultative basis, and participation in all section activities, including reviews of gastrointestinal pathology and radiology for individual patients, and all procedures, particularly endoscopic. The student will be expected to develop a fundamental core knowledge of basic gastroenterology and to participate in a journal activity, and may be called upon to participate in a case presentation at monthly joint GI Grand Round sessions. 4-week elective periods. Wash. Hosp Center.

423 Clinical Gastroenterology (5) Trujillo

Introduction to clinical problems in diagnosis and treatment of gastroenterology in both office and hospital practice. Peritoneoscopy, endoscopy, and biopsies. 4-week elective periods. Univ. Hosp.

426 Research in Metabolism of Sulphur Amino Acids (15) Finkelstein

Study of methionine metabolism in mammalian tissues using several research techniques: kinetic properties of purified enzymes; induction and repression of enzymes by hormones and diet; metabolism of methionine in the isolated perfused rat liver. Projects available in any of the above areas and will be developed further to meet student needs. 12-week elective periods. V.A. Hosp.

430 Clinical Hematology (5) Schechter* and Staff

Participation in the evaluation and treatment of patients with hematological disorders. Ward rounds, morphology review sessions, participation in hematology clinic and Journal Club. 4-week elective periods. V.A. Hosp.

* Dr. Schechter is Chief of the Hematology Section at the Veterans Administration Hospital.

431 **Clinical Hematology and Oncology** (5) — Lessin and Staff

Participation in the diagnosis and therapy of hematologic and oncologic disorders, including in-patient and out-patient consultations, daily care, and follow-up of clinical hematologic problems. Emphasis on acquainting the student with modern hematologic diagnostic procedures and current literature. 4-week elective periods.

432 **Clinical Hematology** (5) — Pierce

Clinical evaluation of in-patients and out-patients with symptoms referrable to the myelopoietic system using bedside and laboratory investigative parameters. 4-week elective periods. Wash. Hosp. Center.

433 **Hematology** (5) — Rheingold

Observation of and participation in diagnosis and treatment of patients with hematologic disorders. 4-week elective periods.

436 **Hematology Research** (10 or 15) — Schechter* and Staff

Research interests of the staff include lymphocyte biology and platelet production and hemostasis. Facilities available to do *in vitro* culture of human peripheral blood and bone marrow, radioisotopic studies, and electron microscopy. 8- or 12-week elective periods.

437 **Blood Transfusion in Clinical Practice** (5) — Greenwalt

Demonstration and discussion of the preparation, properties, and clinical use of the blood components and of the basic genetics and immunology of the blood groups and allotypes. Opportunity to perform bench work in resolving immunologic transfusion problems. 4-week elective periods.

440 **Pulmonary Medicine** (5) — Spagnolo

Participation in the diagnosis and therapy of patients with pulmonary disease; introduction to the management of patients with acute respiratory failure. Daily ward rounds, chest roentgenology review sessions, participation in Journal Club and physiology conference. Emphasis is placed on acquainting the student with modern pulmonary diagnostic procedures and current literature. 4-week elective periods. V.A. Hosp.

442 **Pulmonary Diseases** (5) — Witorsch

Performance and interpretation of pulmonary function studies, including ventilatory, diffusing capacity, and blood gas analysis; daily teaching rounds and supervised consultation on patients with various pulmonary and infectious diseases. Participation in pulmonary clinic; techniques and principles of inhalation therapy. Principles of and experience with respiratory failure and respiratory intensive care. 4-week elective periods. Wash. Hosp. Center.

447 **Pulmonary Medicine** (5) — Delaney

Participation in the diagnosis and therapy of patients with pulmonary disorders. Ward rounds, chest roentgenology sessions, and participation in Journal Club. Emphasis on acquainting the student with modern diagnostic procedures related to patients with pulmonary diseases and current literature. 4-week elective periods. Univ. Hosp.

449 **Primary Care Elective** (5 or 10) — Arling

Students assigned to European-trained family practitioner in small town on a Bahamian out-island. Caring for patients with medical, surgical, pediatric, obstetrical-gynecological, psychiatric, and tropical disease problems. Students responsible for their own transportation. Housing may be provided. 4- to 8-week rotations. Open to two students each period.

450 **Rheumatology Research** (10) Jacobs, Borenste

Participation in on-going clinical and laboratory research projects in t Division of Rheumatology. Major areas of research interest include met ods of early diagnosis of septic arthritis, animal models of inflammato joint disease, and alterations of collagen in degenerative and inflammato arthropathies. 8-week elective periods. Univ. Clinic.

451 **Arthritis and Rheumatic Diseases** (5) Felts, Jacobs, Borenste

Participation in the evaluation and treatment of patients with rheuma diseases, including in-patient and out-patient consultations, daily care a follow-up, and clinical conferences. Regular discussions of selected top in rheumatology, emphasizing differential diagnosis, pathophysiology, a therapeutic modalities. 4-week elective periods.

452 **Clinical Rheumatology** (5) Nacht

Active participation in work-up and management of in-patients and clin patients with rheumatic diseases. History, physical examination, differe tial diagnosis, immunological mechanism, x-ray reading, and use of lab oratory tests are stressed. Laboratory facilities available with emphasis o immunology. 4-week elective periods. V.A. Hosp.

453 **Introduction to Arthritis** (5) Bart

Work-up, rounds, clinic, and consultations on patients with arthritis an rheumatic diseases. Daily discussions on selected topics in rheumatolog including clinical immunology, major disease categories (SLE, RA, gou etc.), differential diagnosis, drug therapy, serological reactions, x-ra changes. 4-week elective periods. Wash. Hosp. Center.

454 **Total Patient Care** (5) Tamag

Participation in total patient care program, including medical rehabilit tion and group evaluation conferences. 4-week elective periods. Uni Hosp.

455 **Rehabilitation Medicine** (5) Chiu, Ende

Management of 1-3 patients on the rehabilitation in-patient service und supervision. Initial medical and neurological work-up, setting of goal and participation in team conferences. Out-patient work will include t use of electromyography and the neuromuscular examination as diagnos tools, as well as management of common musculoskeletal conditio Rounds and teaching activities. 4-week elective periods.

460 **Renal and Electrolyte Disorders** (5) Berkma

Participation in consultations, rounds, and out-patient clinic on patie with renal and electrolyte abnormalities; follow-up of patients. Examin tion of the urinary sediment, peritoneal, and hemodialysis. Conferenc reading assignments, ward rounds, participation in Journal Club. 4-we elective periods.

461 **Clinical Renal Disease** (5) Parri

Participation in clinical and laboratory procedures used in the study renal disease. Ward rounds, consultations, conferences, seminars. 4-we elective periods. Univ. Hosp.

463 **Clinical Application of Tissue Immunology** (5) Kram

Application of immunologic methods to the study of human hypers sitivity states and metabolic diseases; study of serum proteins, includi

protein hormones and enzymes; research principles and methods; tissue typing and flourescent antibody methods. 4-week elective periods. Univ. Hosp.

465 **Renal Diseases and Fluid and Electrolyte Problems** (5) — Jacobson

Participation in office and hospital consultations; care of patients with renal diseases and fluid and electrolyte problems. Familiarization with a variety of renal problems; work-ups of patients with renal disease; evaluation of renal function studies. Emphasis on critical use of medical literature. 4-week elective periods.

469 **Clinical Renal Disease** (5) — Shalhoub*

Broad exposure to and active participation in all the clinical activities of the renal section, including consultations, hemodialysis, outpatient clinic, rounds, conferences, and Journal Club meetings. 4-week elective periods. Time period must first be cleared through instructor's office. V.A. Hosp.

470 **Allergy Clinic** (5) — Ratcliffe, Werth

Lectures, conferences, and attendance at allergy clinic where both adult and child patients are seen. Detailed history-taking, physical examination, and skin-testing techniques. The student will have the option of dealing in depth with an individual patient to learn more about the wide ramifications of severe allergic disease. Discussion of each case with an allergist and development of complete management program. 4-week elective periods. Univ. Clinic.

471 **Allergy Clinic** (5) — Evans, Summers

Lectures, conferences, and attendance at allergy clinic where both adult and child patients are seen. Detailed history-taking, physical examination, and skin-testing techniques. Discussion of each case with an allergist and development of a complete management program. Emphasis on immunological procedures and research. 4-week elective periods. Walter Reed Hosp.

472 **Private Office Practice of Allergy** (5) — Barr

4-week elective period.

474 **Private Office Practice of Allergy** (5) — Seltzer

4-week elective period.

483 **Nuclear Medicine and Ultrasound** (5 or 10) — Sauerbrunn†

Radioisotope methodology and ultrasound techniques as applied to diagnosis in medicine. Interrelation and complementary use of both modalities in evaluating the patient who presents with a diagnostic problem. 4- or 8-week elective periods.

495 **Oncology Review** (5) — Hollinshead

Each student is assigned a carefully selected reading list on one form of cancer. Fundamentals, basic research, and latest clinical approaches are discussed in detail. Each student will write and illustrate a review of his or her subject. Interested students are encouraged to undertake their own research project the following summer. 4-week elective period.

* Dr. Shalhoub is Chief of the Renal Section at the Veterans Administration Hospital.
† Dr. Sauerbrunn is Chief of Nuclear Medicine at the Veterans Administration Hospital.

Microbiology

Chairman: L.F. Affronti

Professors L.F. Affronti, K. Huang, R. Hugh, P.D. Kind, E.M. Lerner II *(Research)*, M. Reich

Associate Research Professors Y. Chu, C.V. Reich

Adjunct Associate Professor J.D. MacLowry

Associate Professorial Lecturer R.F. De Giovanni-Donnelly

Assistant Professors M.R. Loeb *(Research)*, G.V. Stokes

Adjunct Assistant Professor C.E. Piper

106 **Environmental Science of Nosocomial Infection** (1)
Developing a surveillance protocol for nosocomial infection. Microbiological assay of the animate and inanimate components of the hospital environment. (Spring)

128 **Microbiology for New Health Practitioners** (2)
Lecture course for students in allied health program. Basic concepts of microbiology and principles of microbial defense. Study of microorganisms of medical importance.

151 **Public Health Microbiology I** (3)
Medical parasitology, protozoology (intestinal), the Haemosporidia (malaria), the Haemoflagellates, and the metazoa (helminths) of medical importance. (Spring)

152 **Public Health Microbiology II** (2)
Clinical bacteriology; characteristics and identification of the bacteria involved in disease; study of rickettsia and viruses. (Spring)

153 **Public Health Microbiology III** (2)
Study and identification of the flora of water, dairy products, food, and atmosphere. (Spring)

154 **Public Health Microbiology IV** (1)
Mycology: study of medically important fungi, systematic mycoses, dermatomycoses. (Spring)

•201 **Medical Microbiology** (8)
For medical students; open to qualified graduate students with permission. Bacteria, rickettsiae, viruses, yeasts, molds, protozoa, metazoa, immunological concepts which relate to the health and disease of humans —cultural studies, methods of diagnosis, theories. Laboratory fee nonmedical students, $20. (Spring)

211 **Microbiology** (4)
For graduate students. Bacteria viruses, rickettsiae, fungi, parasites, immunological concepts. Prerequisite or concurrent registration: 221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

• Required for medical students.

212 **Pathogenic Bacteriology** (3) — Hugh

Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial disease of man. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 **Tissue Cell Culture and Somatic Variation** (3) — Staff

Techniques of tissue culture and means of studying somatic variations. Prerequisite: Micr 211 or equivalent. (Spring)

215 **Medical Parasitology** (2) — Staff

For graduate students; open to medical students. Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

219 **Scientific Writing for Graduate Students** (1) — Staff

Required of all graduate students prior to writing a thesis or dissertation. Some research experience required. (Academic year)

223 **Antimicrobial Chemotherapy** (1) — Affronti, Reich

For medical students. Lecture course. Selection, clinical applications, and mechanism of action of various drugs and antibiotics used in the treatment of microbial infections. Members of the clinical faculty discuss relevant aspects of clinical chemotherapy. Prerequisite: Micr 201. (Fall)

225 **Microbial Physiology I** (3) — Reich, Affronti

Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 201 or 221–22; Micr 211 or equivalent. (Fall)

226 **Microbial Physiology II** (3) — Reich, Affronti

Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 **Immunology** (3) — Kind, Affronti

Lecture course. Fundamental immunologic concepts. Lectures will cover antigens, antibodies, antigen-antibody reactions *in vitro* and *in vivo*, and the immune response. Prerequisite: Micr 211 or permission of instructor.

230 **Immunology Laboratory** (2) — Kind, Affronti

Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) — Affronti, Kind

Lecture course. Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities, and immunogenetics. Members of the clinical faculty discuss relevant aspects of immunobiology. For medical students; open to graduate students with permission of instructor.

233 **Virology** (3) — Huang

Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) — Huang

Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee for nonmedical students, $20. (Fall)

235 Systematic Bacteriology (2)

History of bacterial classification, international rules of nomenclatur applied to bacteria, development of bacterial classification based on tionships, survey of characteristics of bacterial groups. Prerequisite: 201 or 212 or equivalent. (Fall, odd years)

240–41 Biomedical Instrumentation (4–4)

Same as Bioc 225–26 and Phyl 223–24. Comprehensive study of theo ical and practical application of biomedical instrumentation to the ration, identification, and quantification of materials of interest to medical and forensic scientists. Labratory fee, $50. (Academic y

251 Clinical Laboratory Bacteriology (3)

For graduate students; open to medical students. Detection and identi tion of bacterial agents which cause diseases in humans. Compara isolation and identification methods; emphasis on interpretation and nificance of laboratory observations. Prerequisite: Micr 201 or equi lent. (Fall, even years)

252 Medical Protozoology (1)

For medical students; open to graduate students. Lecture and laborat course. Clinical recognition of important protozoal parasites in medica Disease, its pathology, symptomatology, diagnosis, treatment, and p vention. (Fall)

253 Medical Helminthology (1)

For medical students; open to graduate students. Lecture and laborat course. Clinical recognition of important parasitic worms in medica Disease, its pathology, symptomatology, diagnosis, treatment and p vention. (Fall)

254 Malariology (1)

For medical students; open to graduate students. Lecture and laborat course. Clinical, laboratory, and epidemiological factors in malarial eases in humans. Pathogenesis, symptomatology, clinical, and laborat diagnosis. (Fall)

255 Clinical Virology (1)

Primarily elective course for medical students; open to graduate studen General principles of virology; emphasis on clinical situations. Prereq site: Micr 201 or equivalent. (Fall)

257 Experimental Immunochemistry (3)

Biochemical and physiochemical characterization of antigens and a bodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laborat fee for nonmedical students, $20. Limited enrollment. (Spring, years)

258 Microbial Genetics (2) De Giovanni-Donn

Survey of microbial systems that depict basic concepts of genetic pri ples. Prerequisite: Micr 211 or equivalent. (Spring)

260 Cellular Immunology (1)

Advanced seminars in cellular aspects of the immune response. Con differs each time course is offered. May be repeated for credit. Prere site: Micr 229. (Spring)

277–78 Seminar: Microbiology (1–1)

Required of graduate students. (Academic year)

280 **Virology** (10) Huang
Selected problems, library assignments, laboratory studies. 8-week elective periods.

281 **Biological Basis of Infections** (5) Affronti, Reich
Selected problems, library assignments, laboratory studies, term paper. 4-week elective periods.

282 **Immunology** (5) Kind, Affronti
Selected problems, library assignments, laboratory studies, term paper. 4-week elective periods.

283 **Bacteriology** (10) Hugh
Selected problems, library assignments, laboratory studies, term paper. 8-week elective periods.

289 **Inflammation, Immunity, and Hypersensitivity** (5) Affronti, Kind
4-week elective periods.

290 **Extramural Microbiology Elective** (arr.)
The department arranges for medical students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

293 **Special Topics in Microbiology** (arr.) Staff
Selected topics in microbiology. May be repeated for credit. (Fall and spring)

295 **Research in Microbiology** (arr.) Staff
Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

99–300 **Thesis Research** (3–3) Staff
(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

eurological Surgery

irman: H.V. Rizzoli

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fessors T.H. Milhorat, H.V. Rizzoli
ical Professors M.G. Alper, H.H. Ammermann, G. Di Chiro, G.J. Hayes, .H. Horwitz, C.L. Li, A.K. Ommaya
fessorial Lecturers V.W. Armbrustmacher, D.O. Carpenter, K.M. Earle, .A. Ruge

Associate Professors C.B. Early, D.E. Evans

Associate Clinical Professors F.D. Cooney, A.P. Hustead, W.E. Lawrinson, E.
Mannarino, A.N. Martins, J.P. Murphy

Assistant Professors I.S. Baron-Starke, M.K. Hammock, S. Koulouris

Assistant Clinical Professors J.W. Barrett, C.P.H. Carroll, M.W. Dennis,
Kushner, F.T. Schwartz

Clinical Instructors B.J. Ammermann, E.B. Byrd, K. Ghaemi, J.R. Howe, R.
Mendelsohn, B. Stopak

302 **Clinical Clerkship in Neurosurgery** (2)
2-week elective periods. Univ. Hosp.

380 **Clinical Neurosurgery** (5)
Clinical clerkship in neurosurgical service. Emphasis on neurologic
amination; indications for special neurologic and operative procedur
4-week elective periods. Med. Fac. Assoc.

381 **Clinical Neurosurgery** (5)
Participation in all departmental activities: ward rounds, daily con
ences, radiographic and pathologic studies, operating room procedur
Emphasis on studies of cerebral circulation. 4-week elective periods.
ter Reed Gen. Hosp.

382 **Clinical Neurosurgery** (5)
Participation in all departmental activities: ward rounds, daily con
ences, radiographic and pathologic studies, operating room procedures.
week elective periods. Nat'l Naval Med. Center.

383 **Pediatric Neurosurgery** (5)
Participation in all departmental activities: ward rounds, daily con
ences, radiographic and pathologic studies, operating room procedures.
week elective periods. Children's Hosp.

387 **Clinical Neurosurgery** (5)
Participation in all departmental activities, including ward rounds,
conferences, radiographic and pathologic studies, and operating room p
cedures. 4-week elective periods. Wash. Hosp. Center.

390 **Extramural Neurosurgery Elective** (arr.)
The department arranges for students to spend elective periods in o
institutions. Interested students should contact the chairman of the
partment.

Neurology

Chairman: G.F. Molinari

Director of Encephalographic Laboratory: A. Racy

Professors V.H. Askanas *(Research)*, D.O. Davis, H.H. Hess, G.F. Molin
S. O'Reilly, S.A. Shelburne, Jr.

Adjunct Professor D.E. McFarlin
Clinical Professor W.K. Engel
Professorial Lecturer N.P. Goldstein
Associate Professors A.B. Barnet, M.M. Platt
Associate Clinical Professors K. Abraham, D.J. Fishman, A.J. Levens, N. Myrianthopoulos, K.B. Nelson
Assistant Professors A. Racy, P.F. Teychenne
Assistant Clinical Professors F.H. Anderson, V.J. Blazina, M.M. Davis, V.A. Duggins, R.N. Edelson, G.P. Gabe, J.F. Grim, A.D. Huott, M.C. Korengold, R. Laureno, W.E. Lightfoote II, N.A. Luban, G.M. McCullars, J.F. Morales, L.K. Ng, M.A. Osborn, D. Satinsky, H.M. Silby, E.C. Wilner
Clinical Instructor H.T. Vollero

380 **Clinical Neurology** (5) — Molinari and Staff

Emphasis on neurologic examination; indications for special neurologic tests, e.g., arteriograms, pneumoencephalograms. 4-week elective periods. Univ. Hosp.

382 **Pediatric Neurology** (5) — Shelburne and Staff

Clinical clerkship in diagnostic study and care of in-patients and out-patients; conferences and teaching sessions. 4-week elective periods. Children's Hosp.

383 **Clinical Neurology** (5) — Huott

Emphasis on neurological examination and basic sciences, including neuroanatomy, as applied to clinical material. 4-week elective periods. Walter Reed Gen. Hosp.

384 **Clinical Neurology** (5) — Laureno, Staff

Clerkship in neurology. Participation in neurology consultation service, clinic, and seminars. In-depth research for formal seminar presentation. 4-week elective periods. Wash. Hosp. Center.

390 **Extramural Neurology Elective** (arr.)

Students electing clerkships at the University Hospital can spend another elective period in another institution. They should arrange the elective with the other institution and bring a letter of acceptance to the chairman of the department of neurology for approval. The student is responsible for reporting the grade received to the department of neurology, which in turn will submit it to the Associate Dean for Student Affairs and Admissions.

Obstetrics and Gynecology

Chairman: A.B. Weingold

Professors R.H. Barter, J.B. Craft, Jr., S.E. Fabro, L. McGowan, C.C. Rogers, J.D. Schulman, J.G. Sites, B. Waxman, A.B. Weingold
Professorial Lecturers D.H. Kushner, J.L. Sever, J.B. Sheffery

Clinical Professors W.H. Cooper, O.I. Dodek, Jr., H.A. Donald, M.P. Footer, J.M. Friedman, J.M. Grodin, H.L. Kotz, W.P. McKelway, W.E. Patow, J.W. Pearson, N.J. Price, T.A. Wilson

Associate Professors H. Klaus, J.W. Larsen, Jr.

Associate Clinical Professors A.A. Becker, S.M. Belinsky, J.M. Close, S.D Cooley, E.A. Crisp, C.R.A. Gilbert, C.Z. Jacobson, J.J. Kuhn, W.T. Lady, S.H. Lipsius, L.M. Liverett, S.C. Marinoff, D.H. Martin, L.Q. Pugsley, A.I. Robins, M. Rosenbaum, I.W. Rovner, J. Sacks, P. Soyster, S.F. Stewart, Jr., N.M. Tart, E.W. Titus, Jr., H.P. Treichler, J.C. Walsh, Jr.

Assistant Professors J.H. Grossman III, J.L. Marlow, R.J. Stillman

Assistant Clinical Professors R.E. Badwey, B.A. Band, J.D. Berryman, K. Bis, S.C. Booker, C.L. Campbell, D.R. Carlson, A.A. De Moya, R.V. Erkenbeck, L.E. Fettig, J. Fogel, E.E. Gahres, T.H. Gresinger, R.S. Guy, A.J. Heintze, V.B. Hugh, M.A. Jerome, S.R. Johnson, G.M. Kioko, E.G. Koch, I. Kogan, E.R. Kolvereid, A.I. Lao, A.M. Lazarus, S.T. Lee, R.S. Margolis, D.M. Margulies, J.H. Niles, R.J. Orleans, J.C. Pan, W.R. Perkins, W.F. Peterson, L.C. Radice, M.J. Roberts, M.W. Sandmeyer, M.F.R. Savarese, C.I. Schneiderman, S.H. Shea, G. Speck, C.E. Townsend, A.M.L. Van Rooy, W.D. Wallace, Jr., A.W. Winshel

Assistant Professorial Lecturers J.C. Bulger, A. Kramm

Instructor A.J. Friedman

Clinical Instructors J.E. Alarcon, J.E. Anderson, D.C. Cinnamon, T.A. Cook, Jr., W.D. Cooper, E.E. Cunningham, A.A. Greenfield, F. Hirsch, M.K. Kowalski, R.H. Levitt, J.W. Lyles, R.J. Pierce, R.C. Rigor-Matory, B.S. Rothman, J.E. Safran, S.A. Schlosser, T.W. Scott, J.C. Skilling, H.N. Smith

Special Lecturers R.T. Greenfield, T.E. Schmitt

Staff

•303 **Clinical Obstetrics and Gynecology** (10)

Participation in all obstetrical and gynecological clinics, daily departmental conferences and ward rounds at University, Fairfax, and Columbia Hospitals. Manikin demonstrations of mechanism of labor and various types of operative delivery. (8-week periods throughout academic year)

Weingold, Waxman

375 **Clinical Obstetrics and Gynecology and Family Planning** (5)

Participation in office practice of obstetrics and gynecology and family planning clinic. 4-week elective periods. Med. Fac. Assoc.

McGowan

376 **Gynecologic Oncology and Cytopathology** (5)

Participation in all aspects of clinical in-patient and office diagnosis and treatment of women with gynecologic cancer. Related research. 4-week elective periods. Med. Fac. Assoc.

Stillman

378 **Reproductive Endocrinology** (5)

Clinical and research aspects of reproductive endocrinology. 4-week elective periods.

Larsen

379 **Infectious Diseases in Pregnancy** (5)

Study and participation in research in infectious diseases of pregnancy. 4-week elective periods. Univ. Hosp. and Nat'l Inst. of Health.

• Required for medical students.

380 **Clinical Obstetrics and Gynecology** (5) Gahres, Radice

Participation in patient care, clinics, surgery, and delivery. 4-week elective periods. Alexandria Hosp.

381 **Clinical Obstetrics and Gynecology** (5) Wagstaff, Kirchenbauer

Participation in private practice patient care, clinics, surgery, and delivery. 4-week elective periods.

383 **Clinical Obstetrics and Gynecology** (5) Footer, Friedman

Participation in office practice of obstetrics and gynecology. 4-week elective periods.

386 **Clinical Obstetrics and Gynecology** (5) Cooper, Perkins

Participation in office practice of obstetrics and in gynecological surgery and delivery. 4-week elective periods.

388 **Prenatal Diagnosis of Birth Defects** (5) Fabro and Schulman

Study and participation in research on the chemical aspects of diagnosis and prevention of birth defects. 4-week elective periods. Nat'l Inst. of Environmental Health Science.

390 **Extramural Obstetrics and Gynecology Elective** (arr.)

The department arranges for students to spend elective periods in other institutions. Interested students should contact the chairman of the department.

Ophthalmology

Chairman: M.F. Armaly

Professors M.F. Armaly, D.E. Krueger *(Research)*
Clinical Professors M.M. Parks, M.G. Alper, L.E. Zimmerman
Associate Professors B.S. Fine *(Research)*, D.S. Friendly, J.S. Zacharia
Associate Clinical Professors W.S. Gilbert, L.M. King, Jr., F.G. LaPiana
Assistant Professors Y. Jung *(Research)*, G.A. Stern
Assistant Clinical Professors D.G. Albert, D.K. Berler, H.N. Bernstein, D.T. Casey, W.P. Chalfant, Jr., R. Day, A.L. Fjordbotten, T. Frey, P.T. Gavaris, S.P.Ginsberg, W.B. Glew, J.N. Goldman, T.P. Keenan, M.D. Krinn, M.E. Lederman, J.H. Lodge, J.F. O'Neill, S.S. Pappas, D.E. Schwartz, K.A. Simon, J. Snyder, S. Stoleru, R.N. Sunga, H.A. Urweider, D.M. Wanicur, P.V. Whitmore, H.S. Wicker, B.H. Zeavin, E.M. Zimmerman, M.H. Zimmerman
Clinical Instructors B.G. Brown III, B.S. Bruner, R.S. Deitch, P.A. Dorn, Jr., A.E. Eager, C. Edmonds, B. Ehrlich, L.M. Friedman, R. Huberman, W.S.N. Ibrahim, L.L. Kogan, D.L. Lanter, G. Liss, H.M. McAllister, J.F. Nowell, L.E. Perraut, H.I. Rodman, N.J. Ronsheim, H.J. Starr, E.M. Titer

281 **Ophthalmic Pathology I** (1) L. Zimmerma
Basic science aspects of diseases of the eye. (Spring)

282 **Ophthalmic Pathology II** (3) L. Zimmerma
Diseases of the eye as revealed by gross and microscopic examination. Op
to eight students. Armed Forces Inst. of Path. (Spring)

284 **Ophthalmic Pathology III** (5) L. Zimmerma
Daily participation in service limited to pathology of the eye and
adnexa. 4-week elective periods. Armed Forces Inst. of Path.

380 **Clinical Ophthalmology** (5) Lod
Observation and participation in examination, diagnosis, and manageme
of wide variety of ocular conditions. Emphasis on conducting a gener
ophthalmic examination, recognition of abnormal findings, and manag
ment of common ocular diseases and emergencies. Lectures, rounds, a
seminars. 4-week elective periods. Wash. Hosp. Center.

381 **Clinical Ophthalmology** (3 or 5) Armaly and Sta
Observation and participation in examination, diagnosis, and manageme
of wide variety of ocular conditions in ambulatory patients. Emphasis o
conducting a general ophthalmic examination, recognition of abnormal fin
ings, and management of common ocular diseases. Lectures, rounds, a
seminars. 2- or 4-week elective periods. Burns Bldg.

382 **Clinical Ophthalmology** (3 or 5)
Observation and participation in examination, diagnosis, and manageme
of wide variety of ocular conditions. Emphasis on conducting a gener
ophthalmic examination, recognition of abnormal findings, and manag
ment of common ocular diseases. Lectures, rounds, and seminars. 2- or
week elective periods. Nat'l Naval Med. Center.

390 **Extramural Ophthalmology Elective** (arr.)
Special elective program arranged for selected students at other institution
Interested students should contact the chairman of the department.

Orthopaedic Surgery

Chairman: J.P. Adams

Professors J.P. Adams, H.L. Feffer, W.P. Fortune, P.I. Kenmore, F. Leonar
(Research), D.W. McKay, R.J. Neviaser, R.S. Snell
Adjunct Professor V.L. Nickel
Clinical Professors J.S. Neviaser, L.T. Peterson
Associate Professors S.F. Gunther, R.J. Lewis, S.S. Nason, B.K. Slemmons
Adjunct Associate Professor G.P. Bogumill
Associate Clinical Professors D.M. Brody, R.L. Dow, U.M. Fortune, S.S. Ha
T.J. Radley, B.P. Vitek
Assistant Professors H.O. Goller *(Research)*, M.M. Malawer, D.B. Parsons (R
search), R.B. Reff

Adjunct Assistant Professor H.S. Cattell

Assistant Clinical Professors A.I. Dobranski, S.H. Eisenberg, S.A. Lavine, C.W. McCutchen, P.A. Moskovitz, L.A. Ottenritter, K.A. Peterson, G.J. Schonholtz, M.A. Schultz

Adjunct Instructor W.J. Sadlack

Clinical Instructors B.R. Ain, R.L. Gaertner, J.W. Harvey, D.C. Johnson, W.B. Leadbetter, R.G. Loeffler, C.C. MacCartee, Jr., H.N. Mininberg, F.R.T. Nelson, T.J. Neviaser, R. Ottenberg, J.F. Witte

*302 **Clinical Clerkship in Orthopaedic Surgery** (3) — Lewis and Staff

Basic clinical rotation in orthopaedics for second- and third-year students and fourth-year students who have not had previous orthopaedic rotations. Inpatient, outpatient, and emergency clinical care, with ward and night call responsibilities. Physical diagnosis, x-ray interpretation, trauma, and reconstructive surgery. 2-week elective periods. Univ., Children's, or V.A. Hosp., or Wash. Hosp. Center.

351 **Trauma** (1) — Adams, Haas, Snell, Keimowitz

Relation of trauma to other disease entities and understanding of its effects on the musculo-skeletal system. Description of pathophysiological changes on tissues locally and systemically and of psychological reactions that may accompany such changes. (Spring)

380 **Senior Elective in Orthopaedic Surgery** (5) — Lewis

Students participate in care of orthopaedic inpatients and outpatients, daily rounds, and conferences under the direction of a faculty member at the University Hospital or one of the affiliated hospitals. Prerequisite: Orth 302. 4-week elective periods.

382 **Research in Orthopaedic Surgery** (arr.)

Participation in orthopaedic research to be arranged with various faculty members. Prerequisite: Orth 302.

383 **Sports Medicine** (3 or 5) — Haas

Introduction to athletic injuries, including prevention and management. Prerequisite: Orth 302. Interested students should contact Dr. Haas. 2- or 4-week elective periods.

390 **Extramural Orthopaedic Surgery** (arr.)

The department arranges for students to spend elective periods in other institutions. Prerequisite: Orth 302. Interested students should contact the chairman of the department.

395 **Research in Orthopaedic Surgery** (arr.) — Leonard

4-, 8-, 12-, or 16-week elective periods. Univ. Hosp.

Otolaryngology

Chairman: J.J. McFarland, Jr.

Clinical Professors J.J. McFarland, Jr.; R.E. Pumphrey, Jr., W.M. Trible, B.M. Webb

*Required for medical students.

Associate Clinical Professors N.L. Barr, Jr., S. Epstein, D.N.F. Fairbanks, B
Feldman, M. Fischer, I.S. Jaffee, M.E. Krucoff, J.L. Levine, R.S. Page,
J.A. Sabri

Assistant Clinical Professors R.J. Bobys, A. Small

Clinical Instructors P.A. Coyne, J.H. Graeter, D. Isaacson, G.F. Miller,
B. Modlin, H.H.E. Scheidemandel, S.B. Schreiber, H.C. Stein

380 **Otolaryngology** (5)
Care of inpatients and outpatients. Diagnosis, therapy, rounds, and
ferences. 4-week elective periods. Wash. Hosp. Center.

381 **Otolaryngology** (3 or 5)
Participation in care of outpatients, diagnosis, and therapy; rounds
conferences. 2- or 4-week elective periods. Private office practice.

390 **Extramural Otolaryngology Elective** (arr.)
The department arranges for students to spend elective periods in other
stitutions. Interested students should contact the chairman of the depa
ment.

395 **Clinical Clerkship** (5)
Inpatient and outpatient rotations; operating room experience.
elective periods. Nat'l Naval Med. Center.

Pathology

Chairman: H. Sidransky

Professors S. Bloom, A. Breslow, W.L. Marsh, M.J. Matthews, F.N. Miller,
H. Sidransky, B.H. Smith, C.J. Stahl III, M. Werner *(Laboratory Medicine)*

Clinical Professors C.F. Bishop *(Radiation Therapy)*, H.W. Casey *(Comparative Pathology)*, C.B. Cook, E.B. Helwig *(Dermatologic Pathology)*, N.S. I
W.J. Jaffurs, J.L. Luke *(Forensic Pathology)*, R.S. Melville *(Laboratory Medicine)*, R.E. Palmer, M.J. Williams, L.E. Zimmerman *(Ophthalmic Patholo*

Professorial Lecturers T. Antonovych, P.D. Olch *(History of Medicine)*,
Roberts *(Cardiology)*, A.S. Rabson

Associate Professors A.A. Abraham, Y. Al-Doory *(Laboratory Medicine)*,
Chandra, C.T. Garrett, J.G. Guccion, J.M.B. Hicks, F.S. Jannotta,
Kent, R.B. Lingeman, Y.C. Oertel, D.S. O'Leary *(Laboratory Medicine)*,
Ortega, N.K. Saini, B.C. Zook *(Comparative Pathology)*

Adjunct Associate Professors A.F. Gazdar, W.P. Mulloy

Associate Clinical Professors B.D. Blackbourne *(Forensic Pathology)*,
Brennan, W.F. Enos, I.D. Godwin, G.H. Guin, J.W. Howell *(Clinical Chemistry)*, F.B. Johnson, A.S. Lineberger, H.J. Norris, D.R. Parkinson

Associate Professorial Lecturer H.R. Schumacher

Assistant Professors S.H. Barsky, K.H. Fischer *(Allied Health Sciences)*,
Hawley, Jr., S.P. Kapur, C.N. Murty *(Research)*, J.M. Orenstein, R.H.
terson, S. Silver, J.A. Zeller *(Laboratory Medicine)*

djunct Assistant Professor C.J. Zaloudek

ssistant Clinical Professors A.H. Baumhofer, G. Controni, J.L. Hall, L.G. Hefter, P. Lupovich, G.M. McCullars, R.J. Montali *(Comparative Pathology)*, M.S. Nandedkar, M.K. Rifaat, J.H. Roe, Jr., L.R. Rubel, R. Shamsai, P. Snow, S.W. Theune

ssistant Professorial Lecturers G.C. Baker, C.L. Czerwinski *(Laboratory Medicine)*, M.T. Jessee, C.R. Lissner *(Clinical Microbiology)*, C.W. Locke, Jr., W.P. Monaghan, C.M. Myers, M.J. Prodanovich *(Clinical Chemistry)*, D.E. Uddin

nstructor R.E. Dayhoff *(Research)*

linical Instructors J.A. Maples, P.M. Muehl, R.E. Struempler, L.F. Turner

ecturers E.K.K. Andrus, R.L. Arroyo, Jr., N.C. Brogdon, G.P. Cox, M.J. Diaz, H.I.O. Doerr *(Laboratory Medicine)*, D.D. Erickson, D.G. Holden, R.S. Horkman, J.W. Jones, S.V. Meade, E.A. Michielli, J.G. Saucier, D.E. Schubert, M.L. Serre

pecial Lecturers C.E. Daniels, W.C. Fox, T.L. George, B.J. Green, L.P. Gross, J.T. Johnson III, L.C. Johnson, J.K. Kraml, G.A. Lehmer, W.P. Lewandowski, M.F. Mosley, T.W. Oldfield, D.M. Parker, J.F. Schaumleffel, R.R. Therrien

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ourses numbered 13 through 20 are limited to military personnel in the edical Laboratory Technique Program.

13 **Hematology** (6) **Staff**

Basic hematologic procedures, diagnosis of abnormalities of cellular elements of blood and bone marrow, studies in blood coagulation, quality control in clinical hematology.

14 **Blood Banking** (6) **Staff**

Principles of immunohematology, blood donor center techniques, blood processing techniques, quality control in blood banking.

15 **Clinical Laboratory Rotation** (12) **Staff**

Instructions in laboratory technique, stressing the application of theories and principles of clinical chemistry, clinical microbiology, hematology, and blood banking in the day-to-day operations of the modern clinical laboratory.

16 **Clinical Chemistry** (5) **Staff**

Principles and techniques of blood chemistry analyses, including toxicological analyses for drugs of abuse and environmental poisons.

17 **Urinalysis** (2) **Staff**

Principles and techniques of urine chemistry and microscopic analysis.

18 **Bacteriology** (6) **Staff**

Identification of pathogenic micro-organisms by morphologic and cultural techniques.

19 **Parasitology** (4) **Staff**

Identification of human parasites and their life cycles; concentration methods, staining techniques and media for culture.

20 **Serology** (2)
Principles and techniques of antigen-antibody reaction and immunologic responses.

Courses numbered 100 through 114 are limited to off-campus military personnel in the Medical Technology Program.

100 **Clinical Chemistry Lecture** (4)
Principles and techniques of clinical chemistry, instrumentation, and quality control.

102 **Clinical Chemistry Laboratory** (4)

104 **Clinical Microbiology Lecture** (4)
Principles and techniques of clinical bacteriology, parasitology, and mycology.

106 **Clinical Microbiology Laboratory** (4)

108 **Blood Bank Lecture** (4)
Principles and techniques of donor processing, transfusion, and immunohematology.

110 **Blood Bank Laboratory** (3)

112 **Hematology Lecture** (4)
Principles and techniques of general hematology and coagulation.

114 **Hematology Laboratory** (3)

Courses numbered 121 through 128 are open only to students enrolled in the Bachelor of Science degree program with a major in medical technology.

121 **Introduction to Medical Technology** (4)
Six-week orientation in laboratory medicine. (Fall)

122 **Clinical Chemistry Lecture** (3) Hammersberg and Staff
Ten-week lecture series on routine and special clinical chemistry techniques. (Spring)

123 **Clinical Microbiology Lecture** (2) Fischer and Staff (Fall)
Six-week lecture series on bacteriology, mycology, and virology.

124 **Blood Bank Lecture** (1) Marsh and Staff
Three-week lecture series on immunohematology and transfusion service. (Spring)

125 **Clinical Hematology Lecture** (2) Hammersberg and Staff
Six-week lecture series on routine and special hematology and coagulation. (Fall)

126 **Selected Topics in Laboratory Medicine** (2) Fischer and Staff
Three-week lecture and laboratory series on clinical parasitology. Miscellaneous topics in fluid analysis. (Spring)

127 **Clinical Laboratory Rotation** (7) (Fall)
Sixteen-week rotation in the University Hospital laboratories.

128 **Clinical Laboratory Rotation** (9) **Staff**

Twenty-five-week rotation in University Hospital clinical laboratories. (Spring)

129 **Pathology for New Health Practitioners** (3) **Staff**

Lecture course with optional laboratory. Basic pathologic concepts and infectious diseases; language of pathology; fundamental disease processes. Emphasis on pathogenesis and dynamics of disease. Causation, evolution, and morphology of pathologic changes in the principal diseases of each organ system presented in coordination with clinical lectures in Idis 301. (Fall and spring)

152 **Introduction to Basic Laboratory Medicine** (3) Hammersberg

Theory, performance, and interpretation of some important routine clinical laboratory tests performed in a physician's office, such as complete blood counts with differentials, staining and reading smears, urinalysis and urine cultures, routine chemistries (sugar, BUN, electrolytes), microbiological culture and staining techniques, and organism identification. Lectures, demonstrations, audiovisuals. Supervised and evaluated performance of these tests in a laboratory setting. Prerequisite: Path 129. (Summer)

*201 **Pathology** (8) **Staff**

A year course; required for second-year medical students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies.

203–4 **Pathology** (4–4) **Staff**

For graduate students. General introduction to concepts of disease. Pathology of organ systems; correlation with symptoms and physical signs. Gross and microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 204: Path 203. (Academic year)

†205 **Comparative Pathology I** (3) Zook

Study of disease in vertebrates, comparison with disease in humans. Mechanisms by which various agents provoke illness; body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended prerequisite: courses in anatomy, histology, and physiology. (Fall)

†210 **Comparative Pathology Laboratory** (2) **Zook**

Participation in an autopsy service involving captive wild animals. Comparison of diseases in various animal species with those in humans. Limited to four students. Path. Lab., Nat'l Zoological Park. (Fall)

†215 **Perinatal Pathology Laboratory** (2) **Kent**

Special assignments for dissection and study. Univ. Hosp. (Fall—6 hours per week)

217 **Gross Autopsy Pathology** (1) Blackbourne, Miller

Review of current necropsy cases. Interpretation of clinical symptoms and signs and radiographs on the basis of gross changes in organs. Univ. Hosp. (Spring)

*Required course for medical students.
†Open to limited number of graduate students, with permission.

220 **Medical Mycology** (2) Al-Doo
Study of pathogenic fungi, mycotic diseases, and their clinical aspec Emphasis on handling specimens, diagnosis, and identification of etiolo agents. (Fall)

221 **Medical Mycology Laboratory** (1) Al-Doo
Laboratory complement to Path 220. Prerequisite or concurrent regis tion: Path 220. Laboratory fee, $20. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doo
Study of the opportunistic fungal infections and their serological, clinic and therapeutic aspects. Emphasis on identification of fungi and eval tion of laboratory findings. (Spring)

252 **Forensic Pathology and Medical Jurisprudence** (1) Blackbourne, Ridd
Somatic death, coroner and medical examiner systems, pathology of phy cal and chemical injuries, medical licensure; the physician-patient relati ship and professional liability are discussed. (Spring)

253 **Medicine in Shakespeare** (1) Mill
Seminars with student and staff presentations covering the medically sign cant plays of William Shakespeare. (Spring)

254 **Medicine in Literature** (1) Mill
Series of discussions with student and staff presentations covering nove drama, nonfiction, and poetry of medical significance. (Fall)

260 **Obstetric and Gynecologic Pathology** (1) Jaffe
Organ changes in normal and abnormal pregnancy, including both t mother and the fetus. Diseases of female genital system. (Spring)

261 **Seminar in Experimental Pathology** (1) Sidran
Current topics in research in experimental pathology. (Spring)

266 **Comparative Pathology Elective** (1) Zo
Participation in an autopsy service involving captive wild anima Comparison of diseases in various animal species with those in human Limited to four students. Path. Lab., Nat'l Zoological Park. (Sprin

272–73 **Seminars in Mycology** (1–1) Al-Doo
Conferences and discussions on current topics and latest developments medical mycology. Open to graduate students and residents. May be r peated for credit. (Fall and spring)

275 **Research in Mycology** (2) Al-Doo
Participation in experimental studies in mycotic diseases. Research in lab ratory or community medicine related to mycology. May be repeated credit. (Fall and spring)

280 **Surgical Pathology I** (2) Newman, Palmer, Schwar
Surgical pathology service at participating hospitals. Examining specim from current surgical cases, correlating with clinical manifestations. Un Alexandria, and Andrews AFB Hosps. (Spring—3 hours per week)

*283 **Anatomic Pathology Clerkship** (arr.) St
Necropsy and surgical pathology service. Graduate students receive five mester hours of credit for each four-week period and may receive up to

*Open to limited number of graduate students, with permission.

semester hours of credit for six months full time. Medical students receive five semester hours of credit for each four-week elective period. Prerequisite: Path 201 or 203–4. (Medical students: 4-week elective periods. Graduate students: fall or spring)

284 **Ophthalmic Pathology (5)**

Daily participation in service limited to pathology of the eye and its adnexa. 4-week elective periods. Armed Forces Inst. of Path.

286 **Perinatal Pathology** (5) Kent

Participation in perinatal (fetal and newborn) necropsies. Study of selected teaching cases. Examination of selected placentas for disease. 4-week elective periods. Univ. Hosp.

287 **Immunohematology and Blood Banking** (5) Marsh

Preparation and use of blood and blood products in surgery and in blood diseases studied from laboratory and clinical viewpoints. Emphasis on management of acute clinical situations. 4-week elective periods. Univ. Hosp.

289 **Clinical and Anatomical Pathology** (5) Cook

Daily studies of surgical and necropsy pathology, including forensic pathology; clinical pathology projects, including hematology, nuclear medicine, bacteriology, etc. 4-week elective periods. Fairfax Hosp.

290 **Extramural Pathology Elective** (arr.) Sidransky

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

291 **Clinical and Anatomical Pathology** (5) B. Smith

Opportunity to explore in depth a topic selected from the field of pathology; library study. 4-week elective periods. V.A. Hosp.

294 **Forensic Pathology** (5) Luke

Participation in the activities of the office of the chief medical examiner of the District of Columbia: observation of scene investigation, participation in medico-legal autopsies, attendance at court trials, etc. 4-week elective periods.

*295 **Comparative Pathology II** (arr.) Zook, Casey, Montali

Participation in veterinary pathology service, including wild and domestic animals. Graduate students receive five semester hours of credit for each four-week period and may receive up to 30 semester hours of credit for six months full time. Medical students receive five semester hours of credit for each four-week elective period. Prerequisite: Path 201 or 203–4, and 283. (Medical students: 4-week elective periods. Path. Lab., Nat'l Zoological Park, and Armed Forces Inst. of Path. Graduate students: fall or spring)

296 **Surgical Pathology II** (5) Newman

Evaluation of surgical specimens and correlation with clinical status of patient; description of gross and microscopic findings on assigned cases. 4-week elective periods. Univ. Hosp.

297 **Dermal Pathology** (5) Helwig

Microscopic conferences, review of current material and study sets. 4-week

* Open to limited number of graduate students, with permission.

elective periods. Prerequisite: prior arrangement with instructor. Armed Forces Inst. of Path.

298 **Necropsy Pathology** (5) Staff

Organ changes in disease, gross and microscopic examinations, preparation of protocols. 4-week elective periods. Univ. Hosp.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Pharmacology

Chairman: H.G. Mandel

Professors V.H. Cohn, Jr., S.E. Fabro *(Research)*, P. Klubes, H.G. Mandel, P. Mazel, J.A. Straw, J.R. Williams *(Research)*

Professorial Lecturers J. Axelrod, E. Costa, N.H. Neff

Associate Professors F.P. Abramson, A.M. Suria

Assistant Professors R.J. Anderson, B.L. Slack-Bean

21–22 **Chemistry and Physics of Anesthesia** (3–3) Mazel and Staff

For students in nursing anesthesia. Fundamental concepts of physics; general chemistry, organic chemistry, biochemistry, and their application to medicine and anesthesiology, including chemistry of respiration, acid-base balance, clinical biochemistry and enzymology, hormones, radioisotopes, electronics, physiochemical properties of anesthetic agents, and other related topics. (Academic year)

110–11 **Pharmacological Basis of Anesthesia** (4–4) Mazel and Staff

For students in nursing anesthesia. Fundamental principles of pharmacology; drugs affecting the autonomic nervous system, central nervous system and cardiovascular system; fundamentals of inhalation anesthesia; auxiliary drugs used in anesthesiology; endocrines, cancer chemotherapy; other topics. (Academic year)

114 **Drugs and the Consumer** (3) Cohn and Staff

General concepts concerning drug action in the body. Mechanism of action of some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and sleep-inducing drugs; hayfever, headache and cold remedies; analgesics; antibiotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trade-name drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisite required. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn and Staff

Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. (Spring)

120 **Readings in Pharmacology for Anesthesia** (arr.) Mazel and Staff

For students in nursing anesthesia. Assigned reading in anesthesia and related areas; preparation of reports.

130 **Seminar: Accessory Drugs in Anesthesia** (2) Mazel and Staff

For students in nursing anesthesia. Presentation of the pharmacology and pharmacodynamics of accessory anesthetic drugs; emphasis on those areas not covered in Phar 110–11.

158 **Pharmacology for New Health Practitioners** (2) Klubes and Staff

For students in allied health programs. Basic pharmacology course. Drug preparations, the basis of their therapeutic and toxic actions and their fate in the body. Prerequisite: HCS 110, 112, Phyl 111.

191 **Respiratory Care** (3) Mazel and Staff

Same as Anes 191. For students in nursing anesthesia. Advanced techniques for care of patients requiring total respiratory support.

195 **Electronics for Medical Personnel** (2) Mazel and Staff

Same as Anes 195. For students in nursing anesthesia. Introduction to fundamental principles used in electronic instrumentation for monitoring patient status in operating room and intensive care unit. Signal conditioning, processing and display techniques, special purpose instruments, safety hazards.

201–202 **Pharmacology** (6–2) Straw and Staff

Required for second-year medical students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Prerequisite: Bioc 201, Phyl 201, 212.

203 **Fundamental Principles of Pharmacology** (3) Cohn and Staff

Basic principles of pharmacology, including drug-receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of instructor. (Fall)

205–6 **Pharmacology** (6–2) Cohn and Staff

For graduate students. Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis for rational therapy of disease. Pharmacodynamics, mechanisms of action, physiological disposition, toxicity, and relative evaluation of drugs. Prerequisite to Phar 205: Bioc 221–22, Phar 203, Phyl 201, 212, or approval of department. Prerequisite to Phar 206: Phar 205. (Fall)

215 **Adolescent Drug Abuse** (3) Cohn and Staff

Not open to medical students. Offered off campus through the College of General Studies. Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants

and depressants, alcohol, marijuana, hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mazel and Staff

For medical and graduate students. Recent advances and fields of research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2) Hahn

For medical and graduate students. Current theory on action of drugs, especially chemotherapeutic agents, at molecular level. Effect of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and intermediary metabolites. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff

For medical and graduate students. Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

260 **Endocrine Pharmacology** (1) Hertz and Staff

For medical and graduate students. Lectures and seminars on recent advances in the pharmacology and mechanism of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (3) Staff

For graduate students. Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff

For graduate students. Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn

For graduate students. Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 201 or 205-6 or permission of instructor. (Spring, even years)

273 **Pharmacokinetics: Principles and Applications** (2) Abramson and Staff

Compartmental and physiological models of drug disposition. Problem solving to obtain rate constants, organ clearances, etc., from experimental data. Examples of drug disposition exemplifying various pharmacokinetic approaches. (Spring)

275–76 **Advanced Topics in Pharmacology I–II** (1–1) Anderson and Staff

Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Alternate academic years)

277–78 **Advanced Topics in Pharmacology III–IV** (1–1) Anderson and Staff

Continuation of Phar 275–76. (Alternate academic years)

279 **Special Topics in Pharmacology** (arr.) **Staff**

Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Suria and Staff

Fundamental principles of neuropharmacology. Electrophysiological and biochemical techniques in studying neuropharmacology. Neurotransmitters and their pathways in central nervous system. Drug effects on various neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Pharm 205–6 or equivalent. (Spring, odd years)

285 **Readings in Pharmacology** (arr.) Mazel

For medical students. Assigned reading and preparation of report. (Fall and spring)

286 **Research in Pharmacology** (arr.) **Staff**

For medical students. Participation in experimental studies in pharmacology, particularly endocrinology, cancer chemotherapy, or drug metabolism. (Fall and spring)

287 **Readings in Drug Abuse Literature** (arr.) Cohn, Klubes

Both professional and nonprofessional literature in the general area of drug dependence. Informal monthly luncheon discussions. (Spring)

295 **Reading and Research** (arr.) **Staff**

Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**

(Fall and spring)

398 **Advanced Reading and Research** (arr.) **Staff**

Limited to students preparing for the Doctor of Philosophy general exami- May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

Physiology

Chairman: R.A. Kenney

Professors M.M. Cassidy, M.J. Jackson, R.A. Kenney, C.S. Tidball, M.E. Tidball

Professorial Lecturer D.O. Carpenter

Associate Professors R.A. Lavine, D.W. Watkins

Associate Professorial Lecturer M. Katzper

Assistant Professor J.K. Kelleher

Assistant Professorial Lecturers D. Forman, M. Frank, W.G. Shain, K.R. Spring, J.W. Swann, I.P. Weiss

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

111 **Physiology for New Health Practitioners** (3) M.E. Tidball

For students in physician's assistant, nurse practitioner, and nursing anesthesia programs. Lecture, film, and demonstration. Function and process of the human body covering the major organ systems.

191 **Selected Topics in Human Structure and Function** (3) Kenne

Lecture (2 hours), laboratory (1 hour). Structural and functional basis of physiology. Undergraduate course, required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent and consent of instructor. Open to Columbia College students with approval of advisor. (Fall)

Staff

*201 **Physiology** (8)

Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied human physiology. Prerequisite for graduate students: Anat 201 or Phyl 191, or equivalent; Bioc 201 or 221–22 (Bioc 22 may be taken concurrently); or consent of chairman of department. Open to consortium students only with permission of department chairman. (Spring)

Jackson

205 **Cell Biophysics** (2)

Introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. Required for graduate students intending to take Phyl 201. Students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11–12 or equivalent, and consent of instructor. Open to students in Columbia College with approval of advisor. (Fall)

Staff

212 **Neurobiology** (3)

Same as Anat 212 and Idis 212. Integrated survey of the structure and function of the human nervous system; lecture, clinical demonstration, and laboratory. Laboratory fee, $25.

Cassidy

221 **Seminar** (1)

Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

Staff

223–24 **Biomedical Instrumentation** (4–4)

Same as Bioc 225–26 and Micr 240–41. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Labratory fee, $50. (Academic year)

M.E. Tidball

251 **History of Medicine** (1)

Survey of the great contributors to physiology and medicine in the context of the times in which they lived and worked. (Fall)

Cassidy

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2)

Discussion of principles of fluid and acid-base balance and the application of these principles to specific situations. (Fall)

* Required for medical students, open to graduate students.

254 **Overview of Medical Computing** (2) C. Tidball

Medical applications of computers. Practical experience at a minicomputer console to demonstrate computer principles.

260 **Membrane Physiology** (1) Jackson

Systematic review of the factors which determine the movements of water and solutes across simple cellular membranes and complex epithelial barriers in animal tissues. Prerequisite: Phyl 190 or permission of instructor. (Fall)

261 **Gastrointestinal Physiology** (1) Jackson, Dobbins

Weekly seminar: role of basic sciences in gastroenterology; intra- and extra-mural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey, at an advanced level, of aspects of cardiovascular physiology especially as interrelated with the respiratory and renal systems. (Fall)

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Admission by permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball

Lecture one hour per week, practical experience at student's convenience. Orientation to digital and analog mini-computers. Programming in several languages. Experience with one or more computers. No previous computer experience necessary. (Fall)

271 **Computer Simulation of Physiological Processes** (3) C. Tidball

Programming of physiological simulation will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent, or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball

Readings and discussion on physiological simulations and their evaluation. Prerequisite: Phyl 271 or equilavent, or permission of instructor.

282 **Experimental Physiology** (5) Staff

Participation in an ongoing research program in the department. Programs are currently available in the areas of membrane physiology, intestinal transport, neurophysiology, and cardiovascular physiology. 4-week elective periods.

284 **Advanced Physiology** (5) Staff

Guided study or laboratory experience at an advanced level in a subfield of physiology. Prior arrangements should be made with the individual faculty member. 4-week elective periods.

290 **Extramural Physiology Elective** (arr.)

The department arranges for medical students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

295 **Research** (arr.)
By special arrangement with individual staff members. Approximately fo
clock hours in the laboratory for each semester hour of credit. (Fa
and spring)

298 **Comprehensive Physiology** (arr.)
Guided review of selected areas of physiology appropriate to the student
graduate program. This course satisfies the requirements for the Master
Comprehensive Examination, the Field Examination for doctoral student
minoring in physiology, and Part I of the Cumulative General Examina
tion. Prerequisite or concurrent registration: Phyl 221. (Fall)

299–300 **Thesis Research** (3–3)
(Fall and spring)

396 **Advanced Reading and Research** (2)
Limited to students preparing for the Doctor of Philosophy general exam
nation. Tutorial literature survey of a subfield of physiology and of pert
nent areas of the candidate's minor field. This course satisfies the require
ment for Part II of the Cumulative General Examination in physiology
(Fall and spring)

397 **Development of Dissertation Problem** (2)
Limited to students preparing for the Doctor of Philosophy general exam
nation. Preparation for written and oral presentation of dissertation prob
lem. This course satisfies the requirement for Part III of the Cumulative
General Examination in physiology. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Philosophy candidates. May be repeated for credi
(Fall and spring)

Psychiatry and Behavioral Sciences

Chairman: J. Wiener

Professors J.D. Noshpitz, S. Perlin, J.E. Rankin, J.L. Rapoport *(Research*
D. Reiss, T.G. Webster, L. Yochelson

Adjunct Professor N. Taub

Clinical Professors S.L. Baker, Jr., S. Berman, C.T. Bever, B.S. Brown, R.
Butler, P. Chodoff, R.M. Coleman, L. Cytryn, L. Ferber, C.J. Frederick
G. Gordon, W.L. Granatir, P. Gray, D.A. Hamburg, J.S. Kafka, M.M. Kat
M. Kleinerman, E.I. Kushner, H.P. Laughlin, B.W. MacLennan, M. Meltz
H.A. Meyersburg, T.D. Noble, B. Olshaker, R. Peele, H.L.P. Resnik, R.
Rieger, L.D. Robinson, J.G. Rubin, M.D. Ruffin, R.L. Shapiro, M.F. Shor
J. Spurlock, W. Stark, G.R. Ticho, F.N. Waldrop, H. Weiner *(Experimenta*
Psychology), H.H. Work

Professorial Lecturer H.D. Lederer

Associate Professors J.K. Barber, J.H. Egan, B.L. Frankel, R.B. Kurz, J.
McMillan *(Psychology)*, K. Ravenscroft, Jr., L.I. Sank, P.J. Steinglass

Adjunct Associate Professor F.K. Millican

Associate Professorial Lecturers M. Engel, G.E. Morris *(Allied Health Scienc*

Associate Clinical Professors A.S. Abraham, M.T. Advani, L.W. Allen, E. Black, B.L. Burris, D.D. Cowell, A. D'Agostino, D.I. Davis, B.B. Doyle, R.L. DuPont, Jr., J. Durell, D. Eden, J.B. Erdmann, E.S. Fleming, J.A.H. Forgotson, J.J. Francis, M.S. Glatt, C. Goldberg *(Psychology)*, S. Gordon, Jr., R.M. Greenberg, S.I. Greenspan, R.L. Gross, M.R. Haas, B.M. Hamburg, J.H. Herzberg, F.G. Hilkert, H.A. Hoffman, J.A. Huntzinger, W.C. Johnson, I.H. Kaiser, K.L. Kaplan, J.J. Katzow, H.B. Lehrman, E.J. Lieberman, S.H. Lipsius, T.M. Mackenzie, J.R.S. Malkin, A.E. Marans, I.H. Marill, J.E. Meeks, J.H. Menetrez, I.D. Milowe, F.M. Ochberg, D.Y. Patterson, J.M. Post, J.T. Quattlebaum, T.D. Reynolds *(Experimental Psychiatry)*, C.B. Robinowitz, M.E. Robinson, R.A. Rogers, R.S. Ryback, G. Scarcella, J.L. Sheridan, M.R. Skolnick, J.H. Smith, M.J. Stern, W.J. Stockton, B.C. Straight, S.I. Szara *(Psychopharmacology)*, D.L. Tippett, G.A. Tripp, H.J. Wain, A.F. Ward, Jr. *(Sociology)*, P.S. Weisberg, H.S. Winston, R.E. Wittenberg, P.F. Wohlford, S.J. Wolin, I.M. Zimmerman, J. Zinner

Assistant Professors L.A.M. Bennett *(Research)*, D.C.T. Choate *(Social Work)*, B.A. Copeland, I. Dosovitz, C.B. Feinstein, M. Hertzman, R.A. King, A.B. Livingood, M.E.P. Oliveri *(Research—Psychology)*, E.M. Plionis *(Research)*, C.S. Shaffer, J.R. Shapiro, S.M. Sotsky, L.A. Vitulano

Adjunct Assistant Professors A.T. Billett *(Social Work)*, M.M. Reynolds *(Social Work)*, R.S. Richmond *(Social Work)*

Assistant Clinical Professors S.L. Aledort, R.G. Ammerman, B.S. Arons, E.J. Balsley, W.E. Barquist, E.C. Bergman, S.L. Billet, J.H. Bouma, M. Boverman, L.A. Brain, R.C. Bristol, C.V.A. Cabrera, M.J. Chalick, P.E. Chanel, D.L. Charney, C.T. Chastek, J.C. Chatel, I.M. Chatoor-Koch, J.A.F. Chused, L.R. Conte, R.M. Costell, E.W. Cotlove, G.V. Cotts, L.A. Cove, B. Crowley, C.T. Dunn, R.C. Eisner, J.L. Evans, D.H. Fram, C.H. Frank, J.A. Frank, Jr., R.A. Frank, S.L. Friedman, G.P. Gabe, D.J. Gardner, M.L. Garrett, R.J. Garson, R.B. Gerber, M. Giller, M.R. Goldberger, S.L. Goodman, K.P. Gorelick, B.C. Gorman, H.A. Greenberg, D. Grodsky, S.A. Hassan, N.B. Heller, R.M.A. Hirschfeld, P.B. Holly, D.I. Joseph, K.A. Kessler, B.L. Kraff, L.E. Kreuz, B.J. Landau, P.A. Lange, D.A. Lanham, B.E.S. Lawrence, P.D. Leber, G.D. Legler, L.D. Levi, R.T. Lewit, D.G. Lipman, J.R. Maloney, C.I. Margolis, R.A. McElroy, B.P. McKaig, D.H. McKnew, Jr., H.M. Meagher, W.B. Mendelson, A.M. Messore, G.H. Miller, B.R. Milowe, D.T. Mosher, P.F. Namrow, A.C. Nielsen III, R.A. Nover, A. Olaciregui, B. Pakull, R.R. Palmer, R.V. Palombo, S.R. Pieczenik, H.A. Pincus, H. Plotsky, D.D. Pollock, V.E. Powell, R.A. Ratner, J.L. Read, H.W. Rice, J.D. Robinson, S. Rosenblum, R. Rubovits-Seitz, A.R. Sager, A.J. Salerian, A.H. Sandler, P.J. Santora, S.A. Savitz, G. Schaeffer, L. Schaffer, D.E. Scharff, J.A. Schoettler, G.W. Schwarcz, N.A. Schweig, J.R. Sealy, A. Shmueli, B.M. Smoller, E. Sorel, E.A. Sorrentino, A.H. Stein, H. Steinberg, F. Strassburger, E.S. Taylor, R.S. Teitel, S.S. Tenenblatt, F.B. Thomas *(Social Work)*, W.F. Thompson, C.C. Titus, L. Turner, M.L. Usher, R.W. Wadeson, Jr., J.P. Waletzky, W.F. Weber, D.R. Weinberger, S.M. Weissman, J.L. Wellhouse, H.R. West, C.J. Weyland, N.L. Wilson, W.H. Young, Jr., A.B. Zients

Assistant Professorial Lecturers C.G. Dunn II, A.S. Fonaroff, A. Zappala

Instructor J.L. Gaiter

Adjunct Instructors N.B. Delston, B.J. Fenton, D.R. Glass, Jr., J.A. Jay, G.K
Palys, E.K. Wolf *(Social Work)*

Clinical Instructors J.M. Chertoff, M.M. Clancy, W.F. Conger, M.W. Gros
M.M. Herenda, K. Huang, T.N. Jacob, J.A. Jurand, R.W. Keisling, F.
Kolodner, J.E. Lincoln, R.B. Lott, K.L. Owens *(Social Work)*, P.B. Polati
D. Pope, V.I. Reus, N. Sacirbey, A.B. Salzman, S.E. Samenow *(Psychology)*
M.M. Schwartz, C. Schwarzbeck, S.W. Skoler, P.J. Steinberg, T.A. Teplitz

Special Lecturers J.B. Chassan *(Biostatistics)*, J. Hoffman, S.P. Levi, R.L. Siegel

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All clinical courses are five credit hours per four-week period.

250 **Individual Student Preceptorship** (1) Wiener and Staf

First- and second-year medical students can arrange individual preceptor
ships other than departmental electives listed below with the permission o
the chairman of the department.

*252 **Psychological and Social Factors of Medical Practice** (1) Reiss and Staf

Basic principles of the doctor-patient relationship. Analysis of psychologi
cal growth and development, family process, and the personality of the
physician as they influence everyday medical practice.

*301 **Psychopathology and Conceptual Models** (3) Dunn and Staf

For second-year medical students. Mental mechanisms, psychopathology
introduction to psychiatric syndromes, clinical interviewing, behavioral sc
ences in clinical medicine. (Fall)

*302 **Clinical Clerkship** (10) Webster, Giller
Hoffman, Ryder and Staf

Supervised examination, diagnosis, out-patient and in-patient treatment o
University, St. Elizabeths, Children's, and Washington V.A. Hospitals
and Psychiatric Institute. Case conferences, seminars on psychiatric refer
ral, "psychiatric" drugs, community resources. Psychiatry in general prac
tice stressed. (Fall and spring)

353 **Basic Psychoanalytic Concepts; Clinical Illustrations** (1) Staf

Basic psychoanalytic concepts such as dreams, transference phenomena, an
the various components of personality structure. Participation in discus
sions focusing on psychoanalytic issues and the relevance of such concepts
to the practice of medicine in general. For first- or second-year medical
students. Wash. Psychoanalytic Soc. Bldg. (Spring—eight two-hour
sessions)

365–66 **Seminar: Advanced Family Diagnosis and Psychotherapy** (3–3) Steinglass

Combined didactic and clinical exercises designed to offer in-depth unde
standing of family therapy theory and technique. Open to postgraduate
physicians and advanced graduate students in the behavioral sciences.

381 **Clinical Psychiatry** (5) Webster, Hertzman, Sotsky
Frankel, Wiener, Perl

Student performs as acting intern on one or more of the psychiatry serv
ices of the Medical Center: inpatient and emergency (Hertzman), outpa

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* Required for medical students.

tient (Sotsky), and consultation-liaison (Frankel). Assignments are based on student preference within limits of feasibility for the elective period involved. 4-week elective periods.

383 **Psychological Aspects of Medical Illness and Care** (10 or 15) — Frankel

Student participates in an individualized program on the consultation-liaison service, with emphasis on psychosocial factors affecting the onset, manifestations, and treatment of medical illness. Involvement in consultation process, conferences, liaison meetings, individual supervision of clinical work, and related readings. 8- or 12-week elective periods.

384 **Outpatient Psychiatry** (10) — Sotsky, Steinglass

Student participates as acting intern in multidisciplinary outpatient clinic team. Diagnostic assessment, crisis intervention, pharmacotherapy; supervision of clinical work and readings in field; participation in clinical case conferences, assessment conferences, and relevant resident seminars. 8-week elective periods.

385 **Psychosocial Aspects of Heart Disease** (5) — Stern

Student participates under direct supervision of faculty in individual and group work with post-myocardial infarction patients and their families during hospitalization and the subsequent follow-up period. Study of psychological, social, and physiological aspects of heart disease, including exercise and rehabilitation. Participation in related seminars, psychiatry-medicine liaison activities, and related readings and discussion. 4-week elective periods.

386 **Substance Abuse** (5) — Advani

Student participates in individualized program in alcohol and/or other drug abuse. Supervised clinical work with patients and families, research experience, and related readings. Participation in seminars and team activities. 4-week elective periods.

387 **Family Research** (10) — Reiss and Staff

Student participates in family research and performs own project with individual supervision. Related readings. 8-week elective periods.

388 **Child and Adolescent Psychiatry** (5) — Egan, Noshpitz, Wiener, Feinstein, Ravenscroft

Student performs as acting intern in child psychiatry. A specialized elective in consultation to pediatric wards, outpatient evaluation and treatment of selected child patients and their families, and/or inpatient child and adolescent services. Eight weeks required for specialized experience in all three areas. Individualized program by arrangement. Assignments based on student's preference and prior experience, within limits of feasibility for elective period involved. 4-week elective periods. Children's Hosp.

390 **Extramural Psychiatry Elective** (5)

The department may arrange for students to spend elective periods at other institutions. 4-week elective periods.

395 **Psychiatric Day Care: Adults, Adolescents** (5) — Hoffman, Advani, Quattlebaum

Student participates in the evaluation of patients referred for day care and in the various activities and programs in the day care centers. Research pertaining to the day care center in its role in the treatment of psychiatric patients. 4-week elective periods. Psychiatric Institute.

396 Psychiatry on the Gerontology Service (5) Lange, Kleh, Hoffm

Student participates in supervised clinical work on a short-term, multi-di ciplinary treatment center for gerontological patients. The focus is o comprehensive evaluations, working with the family, and effective di charge planning. 4-week elective periods. Psychiatric Institute.

397 Schizophrenic Reactions (5) Ehlers, Bullard*

Student observes and participates in the treatment and management o patients, and in staff meetings. Individual supervision, case write-ups, an selected readings. 4-week elective periods. Chestnut Lodge, Rockville, Md.

398 Clinical Psychiatry (5) Giller and Staf

Student participates in clinical care of patients in a public mental hospit and community mental health center. Opportunity for observation an participation in a variety of treatment modalities: supervised individual an group therapy, somatic therapies, psychodrama. Research opportunit available. 4-week elective periods. St. Elizabeths Hosp.

400 Forensic Psychiatry (5) Ward, Saiger, Smit

Opportunity for supervised research; evaluation and rehabilitation of crim inal offenders; contacts with courts; individual supervision and readings Individualized program by arrangement. 4-week elective periods. St. Eliza beths Hosp.

404 Clinical Research and Psychopharmacology (5) Goodwin and Staf

Student participates in clinical research at the Clinical Psychobiology Branch, N.I.M.H., which conducts a research and treatment program on depression and manic-depressive disorders. Facilities include an inpatient ward, outpatient department, and biochemical laboratories. Student works on an individualized component of a major research project with direct supervision by a research psychiatrist. Participation in clinical conferences didactic lecture series, research conferences, and planning meetings. 4 week elective periods.

406 Psychiatric Education, Research, and Administration (5) Robinowitz and Staf

Student preceptorship. Practicum experience, theoretical instruction, partic ipation in research, and individual project. Close working contact with director and staff of education office of national specialty society. Opportunity to observe operations and for contacts with leaders in field. Student gains knowledge and perspective of research and administration pertaining to women in medicine, psychiatric education, manpower development relevant to health care delivery, continuing education, federal and legislative affairs, health planning, and relation of medical education to practice. Prior personal interview required. 4-week elective periods. American Psychiatric Ass'n.

409 Independent Studies (5) Webster

Individualized studies, clinical training, or research experience. Selection on basis of student interest, personal interview, and available resources. Possible subjects may include death and dying, suicide, medical ethics, or other psychiatry and behavioral science interests of the student and available faculty. 4-week elective periods.

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* Dr. Bullard is Senior Consultant at Chestnut Lodge.

411 **Group Therapy** (1) Weisberg

Combined didactic and participatory course in group therapy. Students will function as observer-members of on-going group, and will participate in lecture-supervision sessions.

412 **Mental Health Issues for Deaf People** (1) Robinson

Mental health and illness from the perspective of auditory deprivation. Lectures, discussion, films, and field trips to educational and mental health facilities for deaf people are combined with varying degrees of practical and research involvement.

413 **Autobiographical and Fictional Accounts of Madness** (1) Gorelick

Reading of a variety of personal accounts—some fictional, others autobiographical—of the inner experience of madness. Works include *Breakdown* by Robert Dahl and *50 Minute Hour* by Robert Lindner. St. Elizabeths Hosp.

414 **History of Mental Illness and Therapeutics** (1) Gorelick

Consideration of the historical periods of primitive healing, Greek medicine, Arabic medicine, Christian healing, witchcraft phenomena, and key developments of the last 200 years.

415 **Identity and Role of the Physician** (1) Robinowitz

The role and identity of the physician, with special emphasis on women physicians. Didactic material on the role and identity of the physician combined with experiential models, including group dynamics. (Limited to six students.)

416 **The Application of Psychoanalytic Principles to the Practice of Medicine** (1) Kaiser

Offered by the Extension Division of the Washington, D.C., Psychoanalytic Institute. (Limited to six students.)

417 **Geriatric Psychiatry** (1) Legler

Students accompany preceptor who functions as geriatric consultant to the National Capital Housing Authority.

418 **Medical Aspects of Alcoholism** (3) Wolin and Staff

Seminar in alcohol abuse and alcoholism focusing on the natural course of the illness, diagnosis, assessment, and evaluation of the alcoholic individual and family. Prerequisite: permission of instructor. (Fall)

419 **Seminar: Special Topics and Techniques in Family Psychotherapy** (3) Steinglass, Usher

An advanced seminar for family therapists. The concept of the family life cycle will be used as a framework for identifying specific developmental phases in family life. Marital therapy, family therapy with young children. sexual dysfunction, divorce, occupational crises, retirement. Phase-specific problems and specialized intervention techniques. Participants must be currently seeing families in therapy. Permission of the instructor(s) required.

420 **Research Methods for the Direct Study of the Family** (3) Reiss

Basic concepts in the design of quantitative studies of the development and function of the family. Topics to be covered include the use of theory, grounded observations, and personal experience in the design of research; analyses of verbal interaction; social systems analyses; a comparative anal-

ysis of interview methods, laboratory procedures, and naturalistic obser
tions. Prerequisite: permission of instructor. (Fall)

421 **Supervision of Marital and Family Therapy** (3) Usu
Issues in the supervision of students of marital and family therapy. Va
ious techniques of supervision (written report, audiotape and videotap
and one-way mirror) will be explored. Issues related to teaching a
learning objectives, student and supervisor relationships, accountabili
and confidentiality will be examined. Participants will be required to ha
a student whom they are currently supervising. Videotapes of the parti
pants' supervisory sessions will be examined in class. Prerequisite: permi
sion of instructor.

422 **Introduction to Family Theory and Therapy** (3) Dep
Readings in structural and problem-solving approaches to family therap
and live observation of families and couples with recent hospitalized acu
psychiatric patients. Prerequisite: permission of instructor.

Radiology*

Chairman: D.O. Davis

Directors of Divisions: A.C. Wyman *(Diagnostic Radiology)*, R.C. Reba *(Nu
clear Medicine)*, D.J. Goodenough *(Radiation Physics)*, C.C. Rogers *(Radia
tion Oncology and Biophysics)*

Professors E.W. Bradley *(Research)*, W.C. Eckelman *(Nuclear Medicine)*, D
Davis, A.M. Lewicki, M. Majd, W.J. McSweeney, W.W. Olmsted, R.C. Re
(Nuclear Medicine), S.D. Rockoff, C.C. Rogers *(Radiation Oncology)*, B.J.
Sauerbrunn *(Nuclear Medicine)*, V.M. Varma *(Nuclear Medicine)*, J.R. Wi
liams *(Research)*

Clinical Professors R.M. Allman, G.J. Augustin, C.V. Cimmino, J.L. Doppma
J.G. Maier *(Radiation Oncology)*, J.J. Smith *(Nuclear Medicine)*, A.C. W
man

Professorial Lecturers J.R. Andrews, J.E. Lichtenstein, J.E. Madewell

Associate Professors R.O. Bondelid *(Research)*, M.E. Bradley *(Research)*, E.
Druy, D.J. Goodenough *(Radiation Physics)*, R.E. Johnsonbaugh, S.N. L
(Radiation Oncology), C.C. Ling, B.M. Potter, W.J. Rzeszotarski *(Research
Nuclear Medicine)*

Adjunct Associate Professors W.J. Bunnell, J.A. Deye *(Radiation Physics
G.L. Dunson

Associate Clinical Professors P.F. Abraham, J.A. Burwell, C.M. Citrin, F.J
Gerber *(Nuclear Medicine)*, E.R. Jacobs, B.T. Katzen, H.J. Kicherer, E.
Kotlyarov, R.J. Lull, J.D. Marriott, D.D. Maxwell, S. Mittler, C.F. Murph
W.J. Nelson, N.G. Nolan *(Nuclear Medicine)*

Assistant Professors J.N. Albarelli, J.A. Becker, D.R. Brallier, A.N. Gulat
A.M. Herskovic *(Radiation Oncology)*, R.F. Kiepfer *(Nuclear Medicine
E.R. Lipsit, J.I. Rich, A.J. Roach, M.C. Schell, K.E. Weaver *(Radiation
Physics)*

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* Unless otherwise indicated, all faculty appointments are in the *Diagnostic Radiology* division.

Assistant Research Professors L.S. August, R.E. Gibson, S.M. Levenson, G.E. Miller, C.H. Paik *(Nuclear Medicine)*, P. Shapiro, R.B. Theus

Adjunct Assistant Professors F.B. Atkins, E.J. Banasiak, E.G. Briefel *(Radiation Physics)*, M.L. Cianci, R.M. Fisher, D.A. Marden, T.J. Schmitz III, M.H. Selikson *(Radiation Physics)*

Assistant Clinical Professors A.W. Baker *(Nuclear Medicine)*, J.B. Bowers, B.G. Brotman, S.R. Brown, A.S. Cigtay, M.D.M. Faris, R.S. Frankel, N. Ghaed *(Nuclear Medicine)*, L.M. Glassman, K. Horvath-Pushkas, R.J. Kaminski, D. Kramer, S.J. Kurzbard, A.L. Moniot *(Nuclear Medicine Technology)*, K.G. Rieth, M. Rosenstein *(Radiation Physics)*, J.A. Russotto *(Nuclear Medicine)*, G.S. Staples, M.A. Thomas, M.A. Weiss, R.L. White, J.W. Winebright *(Nuclear Medicine Technology)*, K.S. Yingling

Instructor A. Castagnolo *(Allied Health)*

Adjunct Instructors G.R. Alkire *(Nuclear Medicine)*, G.L. Colouris, G.W. Elliott, J.C. Espie IV, F.M. Fender *(Radiation Oncology)*, T.R. Fewell, G.E. Flook, R.W. Jones, R.W. Killian, T.E. Lewis, S.M. Nichols, B.R. Rock, L.W. Treadwell, Jr., W.J. Weiler *(Nuclear Medicine)*, E.H. Whittemore, C.J. Zimmerman, Jr.

Clinical Instructors J.L. Murray, S.M. Perl, G. Tievsky, L. Wener

Special Lecturers J.W. Andrews *(Nuclear Medicine Technology)*, D.M. Barron *(Nuclear Medicine Technology)*, D.F. Bates III *(Nuclear Medicine Technology)*, R.E. Brown *(Nuclear Medicine Technology)*, J.H. Coenen *(Nuclear Medicine Technology)*, D.L. Daniels *(Nuclear Medicine Technology)*, T.H. Fleckner, J.J. McBride, T.A. Peters *(Nuclear Medicine Technology)*, J.A. Stickland

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Courses numbered 40 through 190 are limited to students in the Associate in Science and Bachelor of Science degree programs in radiologic technology, nuclear medicine, and radiologic science and administration.

40 **Clinical Training and Experience in X-ray Technology I** (2) — Gerber, Marriott

Instruction and close supervision in the use of radiologic techniques to examine the digestive, urinary, female reproductive, central nervous, and circulatory systems; chest and abdomen radiography, orthopaedic radiography, ENT and neurologic radiography, portable radiographic examinations, pediatric radiography, nuclear medicine, radiation therapy.

41 **Clinical Training and Experience in X-ray Technology II** (2) — Gerber, Marriott

Prerequisite: Rad 40.

42 **Clinical Training and Experience in X-ray Technology III** (2) — Gerber, Marriott

Prerequisite: Rad 40, 41.

43 **Clinical Experience in Nuclear Medicine I** (4) — Reba and Staff

Practical study and supervised performance; emphasis on indications and contraindications, procedures and methods, physiological and procedural factors which may result in a false study, radiation safety techniques, preparation and development of new radiopharmaceuticals and research methodology, and administrative procedures.

44 **Clinical Experience in Nuclear Medicine II** (5) Rol

Prerequisite: Rad 43.

50 **Radiologic Anatomy I** (4) Zimmerman, Fish

Human anatomy as applied to radiologic terminology. Structure and fu tion of the human skeleton and topographical anatomy, both normal a pathological.

51 **Radiologic Anatomy II** (4) Zimmerman, Fish

Human anatomy as applied to radiographic procedures. Structural a functional approach, application to radiography of the digestive, respirat ry, excretory, endocrine, reproductive, and nervous systems and the orga of special sense. Some discussion of medical and surgical disease Prerequisite: Rad 50.

55 **Stationary and Rectilinear Imaging** (3) Alk

Related anatomy, physiology, and pathology of imaging procedures; bas methodology of these and related procedures, including bone, brain, liv liver function, bone marrow, lung, liver-lung, transmission, cardiac bloo pool, cisternography, spleen, parathyroid, pancreas, lung ventilation, pert tid ventriculography; miscellaneous scans; brain and cardiac flow studie

56 **Hematologic and Radionuclide Dilution Procedures** (3) Alk

Related anatomy, physiology, and pathology of hematologic and radio nuclide dilution procedures; basic protocol for these procedures, includin plasma volume and related plasma studies, red cell volume and related re cell studies, studies of iron metabolism, and the placental localization an scanning.

57 **Organ Concentration-Excretion Measurements** (3) Hergenroth

Related anatomy, physiology, and pathology of organ concentration-excr tion measurements; the procedure for those measurements, including th roid uptake and its variations, thyroid scan, metastatic chest survey, ren gram, renal scan, and renal flow study.

58 **Gastrointestinal Absorption Measurements** (1) Weil

Related anatomy, physiology, and pathology of gastrointestinal absorptio measurements; the procedure for those measurements, including fat absorp tion studies (triolein and oleic acid) and the three stages of the vitam B-12 absorption study (Schilling test).

59 **Competitive Binding Radioimmunoassay** (2) Weil

Basic concepts of radioassay; basic procedure for any competitive bindin radioassay. Specific concepts and procedure for T3, T4, and serum B-1 determinations; factors affecting those determinations and the interpretatio of their results.

60 **Radiographic Technique I** (4) Easterbrooks, Schmi

Theoretical and practical study of x-ray machines, equipment, patient po tioning, and radiographic qualities; history and development of x-ray phototiming, x-ray tubes, and Bucky grids and their uses; anatomical land marks, radiographic terminology, exposure factors, and variations; radio graphic calibration (quality and quantity); marking of films and factor governing good film quality. Laboratory work.

61 **Radiographic Technique II** (4) Easterbrooks, Schmi

Preparation of exposure charts and use of radiation protection device practical applications of technical uses of stationary and portable equipme

under supervision; techniques for pediatric radiographs and methods of positioning and restriction; intra-oral radiography techniques. Photofluorographic chest units, departmental floor plans, basic office procedures. Laboratory work. Prerequisite: Rad 60.

62 **Darkroom Technology** (3) Zimmerman, Fisher

Processing of film after exposure; care and handling of conventional and automatic darkroom equipment; types of film, handling and storage; mixing and handling of chemicals and the action and quantity of these chemicals in the processing of film; effects of heat and cold on these chemicals, diagnosing of various improper developing techniques. Laboratory work.

65 **Basic Chemistry** (3) Weiler

Introduction to basic chemistry: kinds of matter, atomic structure, the periodic table, chemical bonding, formulae and equations, solutions, acid-base reactions; introduction to organic chemistry and biochemistry; laboratory sessions.

66 **Radiopharmaceuticals** (3) Weiler

Uses of radionuclides in medicine, basic principles of a Mo-99/Tc-99m generator, radiopharmaceuticals and their action within the body, preparation of radiopharmaceuticals using generator-produced nuclides, quality control, accountability, procurement, clinical orientation.

70 **Radiographic Physics I** (4) Elliott

Fundamental concepts of physics, including standards of measure, metric measurement, laws of motion, weight, work, power, energy, and momentum. Introduction to structure of matter, atomic and nuclear structure, periodic tables, chemical bonding, material and artificial radioactivity, series decay. Description and use of electrostatics and magnetism. Laboratory work.

71 **Radiographic Physics II** (4) Elliott

Fundamental concepts of current flow, ohms and Joule's law, series/parallel, compound circuits, battery types and functions, metering devices, electrical safety. Description and function of electromagnetism and induction, alternating current principles, AC cycle, induction and inductor, capacitance and capacitors, applications of electronic principles to x-ray equipment and components; transformers, generators, motors, rectifiers, current control devices, fuses, circuit breakers, magnetic relays, circuitry of fixed and mobile x-ray units. Laboratory work.

72 **Radiation Instrumentation** (5) Alkire

Theoretical and practical aspects of radiation detectors; types, components, and operation of detectors; collimators; geometry; introduction to rectilinear scanning; introduction to stationary imaging; clinical orientation.

75 **Fundamentals of Atomic and Nuclear Physics** (3) Hergenrother

Basic units, quantum theory, Bohr theory, atomic and nuclear structure, radioactivity and decay, alpha and beta particles, electromagnetic radiation, series decay, radioactive equilibrium, I.C.R.U.

80 **Mathematics of Radiology** (3) Elliot, Schmitz

Principles of mathematics as applicable to the physics of radiologic technology; use of logarithms, including multiplication, division, powers, and roots; scientific notation; geometry of the circle, square, and rectangle; basic trigonometric functions; linear equations in the unknown; Cartesian

coordinate plane; slope of straight line; linear equations from given co
tions; and graphic solution of two or more linear equations.

81 **Basic Mathematics** (3) Hergenro

Review of basic high school mathematics, basic algebra, common and n
ral logarithms and their manipulation, linear and logarithmic graphing
manipulation of a log-log slide rule.

82 **Applied Technical Mathematics** (3) Hergenro

Mathematics as applicable to nuclear medicine. Basic decay formula and
variations, calculation of doses of radionuclides, basic statistics terminol
frequency distributions, confidence limits, standard error, efficient distri
tion of counting time, statistics relating to rectilinear and stationary ima
ing.

90 **Ethics** (1) Zimmerman, Fi

Ethics of physician/technician/patient relationships. Responsibilities, le
moral and legal, to physician and patient; the rapport expected of
technologist.

91 **Special Projects in Radiology** (arr.)

Independent study on an aspect of radiology worked out between the
dent and the instructor.

92 **Basic Physics** (3) McEl

Developmental course for students who need additional work in phys
and mathematics. Basic atomic structure, practice in computation, elec
and magnetic statics, motors, transformers, concepts of electricity,
circuits. Introduction to radiological physics including radiation prod
tion, radiological units, and interactions of radiation with matter.

93 **Radiobiology and Radiation Dosimetry** (3) We

Interaction of radiation with matter; radiation effects on molecular, cellu
tissue, and organ levels; genetic and somatic effects of ionizing radiati
classical and M.I.R.D. methods of absorbed dose calculation.

94 **Radiological Safety** (3) We

Introduction to radiation safety; units of radiation exposure and dose
censing; NRC regulations; accountability and records, receipt, storage, h
dling, transportation, and disposal of radioactive materials; monitori
shielding; dose-distance relationships; personnel dosimetry; radiation
ness; radiac instruments; radiation safety clothing; radioactive "sp
procedure.

95 **Radiation Safety** (3) Jones, Mel

Radiation tolerance, safety, and reporting photodosimetry; protective m
ods, control devices, shielding, half-life, detection, detection equipment,
sign and operation, thermoluminescence (its operation and uses), termin
ogy and subject matter. Laboratory work.

96 **Radiation Biology and Survey of Radiation Therapy** (3) Stickl

Effects of ionizing radiation on various cells, tissues, organs, and
human body as a whole; organic and inorganic molecules; the human
munity system; effects on pregnancy and relative radiosensitivity of
developing embryo; possible genetic effects of radiation; chronic and a
effects of radiation; use and history of radiation in therapy; classifica
of neoplasms, types of therapy units, and treatments. Prerequisite:
50, 70, 71.

97 **Special Procedures** (3) Zimmerman, Fisher

Techniques of radiology employing contrast media. Fluoroscopy, spot films, body section radiography, pelvimetry, placentography, location of foreign bodies in the eye, angiography, O.R. techniques, oral procedures, stereoscopy, pediatric angiographic procedures. Prerequisite: Rad 61, 71.

98 **Therapy Procedures** (1) Hergenrother

Introduction to radiation therapy and radium implants. Related anatomy, physiology, and pathology of phosphorous–32 and iodine–131 therapies and the technologist's responsibilities concerning them.

99 **Alternate Imaging Systems** (3) Jones

Various modalities of radiographic imaging systems; types of equipment and design. Intensifying screens, fluoroscopy, spot filming, image intensification, cinefluoroscopy, film changers, reproduction, polaroid imaging, thermography, ultrasound, electron radiography, computerized axial tomography, principles of nuclear medicine. Prerequisite: Rad 60, 71, and 95.

140 **Radiology Administration** (4) Bunnell

Key areas of administration; human skills, technical skills, and conceptual awareness as they pertain to radiologic management at the department level. Traditional management concepts and models developed through modern texts and current journals which address the topics of organizational behavior, planning, controlling, etc. Discussion and exploration of the logistics of managing a radiology section. Prerequisite: HCA 135, 142, 153, 156.

145 **Administrative Project: Diagnostic Radiology** (3) Bunnell

For students concentrating in diagnostic radiology. Students identify, develop, and complete a project for a radiology department using administrative principles. Prerequisite: Rad 140.

147 **Administrative Project: Nuclear Medicine** (3) Bunnell

For students concentrating in nuclear medicine. Students identify, develop, and complete a project for a nuclear medicine department using administrative principles. Prerequisite: Rad 140.

149 **Administrative Project: Radiation Therapy** (3) Bunnell

For students concentrating in radiation therapy. Students identify, develop, and complete a project for a radiation therapy department using administrative principles. Prerequisite: Rad 140.

150 **Radiology Senior Study** (2) Goodenough and Staff

Independent study for radiologic sciences and administration students. Faculty monitor acts as consultant to projects and gives minimal guidance. Project reports must be submitted for evaluation.

167 **Radiation Physics and Safety I** (3) Goodenough and Staff

Concepts of matter and energy and electromagnetic radiation. Mechanisms in the production of x-rays and x-ray circuits, including half-wave and full-wave rectification and three-phase generators. Interaction of radiation with matter, emphasizing the photoelectric, Compton, and pair-production effect. Radiation detection and dosimetry, Roentgen rad and rem units of radiation. Radiation safety as applied to diagnostic radiology, nuclear medicine, and radiotherapy, including effects of time, distance, and shielding. Maximum permissible concentrations, internal dose problems.

171 **Radiological Electronics and Engineering** (3) McE

Introduction to basic electronics and the operation, limitation, use, principles in the selection of instrumentation. Transistors, power supp amplifiers, major circuit components of radiation detection instrume gamma camera and rectilinear scanners, radiotherapy orthovoltage linear accelerators, and diagnostic radiography equipment.

175 **Physics of Radiological Imaging** (3) Goodenough, We

For students concentrating in diagnostic radiology. Image formation transmission through radiological and related photo-optical devices, ma ing system analysis techniques. Concepts of sensitivity, contrast, and mo lation transfer functions. Description and analysis of photo receptors, cluding film grids and Bucky and intensifier screens. Radiographic develo ment process. Fluoroscopy, cine radiography, and video techniques; ima storage electronic radiography; and solid state imaging panels. Ultra sono raphy and thermography. Demonstrations and experiments in control a evaluation of radiologic imaging. Prerequisite: Rad 167.

176 **Physics of Nuclear Medicine** (3) Goodenough, Brie

For students concentrating in nuclear medicine. Concepts of radioactivi including beta decay, isomeric transitions, electron capture, internal tran tion, alpha decay, and the auger effect. Isotopic half-life secular and tr sient equilibrium. Artificial transmutations, nuclear reactions, counting s tistics, and selection of instrumentation. Scintillation spectrometry te niques. Rectilinear scanners, gamma camera, and computer technology nuclear medicine. Demonstrations and experiments in control and evalu tion of imaging. Prerequisite: Rad 167.

177 **Dosimetry in Radiation Therapy** (3) Deye, Padi

For students concentrating in radiotherapy. Concepts of depth dose, is dose curves, and tissue air ratios for different energies, TSD, and field siz Techniques of treatment planning for stationary, multiple, and moving p tals for Co-60 and megavoltage linear accelerators. Concepts of wed fields and compensation for multiple TSD surfaces and tissue inhomoge ties. Dosimetry of linear sources. Quimby and Paterson Parker dosime systems. Computer techniques in radiotherapy. Introduction to the do try of electrons, neutrons, and the heavy particles. Demonstrations and periments illustrating dosimetric principles. Prerequisite: Rad 167.

190 **Radiobiology** (3) Brad

Advanced course in biological aspects of radiation. Chemical, physica and genetic effects of radiation on cells and organisms. Radioecology, sa ty, and health. Legal aspects of control. Prerequisite: Rad 93 or 96.

195 **Directed Study in Radiation Physics** (2) Goodenough and Sta

Projects in selected specialty demonstrating applications of radiation phy ics, imaging or dosimetric principles to radiographic quality control a evaluation of radiological equipment systems. Prerequisite: Rad 167; 1 175 or 176 or 177.

383 **Clinical Radiology** (5) Wyman and Sta

Radiologic and differential diagnosis with specific emphasis on the role diagnostic radiology in clinical problem-solving. Each student is assigne a patient population in Medicine and Surgery, and correlates radiolog examinations with clinical manifestations of disease. Brief clinical an radiological summaries on patients may be required. Procedures, co conferences with staff members, and interaction with medical and surgic

staff. Daily lectures and departmental staff conferences. ACR Learning File and audio visual material. 4-week elective periods. Univ. Hosp.

384 **Diagnostic Radiology** (5) Burwell and Staff

Participation in general radiography, fluoroscopy, and special procedures; interpretation of radiologic procedures with staff; review and study of teaching film file. Attendance at medical, surgical, and pediatric staff conferences. 4-week elective periods. Fairfax Hosp.

385 **Nuclear Medicine** (5) Reba and Staff

Radiotracer techniques as applied to clinical medicine in biological and medical research. Students may participate as clinical nuclear medicine interns or as research assistants. 4-week elective periods. Univ. Hosp.

386 **Radiation Oncology** (5) Rogers and Staff

Introduction to radiotherapeutic techniques, physics of high-energy radiation and instrumentation. Radiation treatment and correlated management of malignant diseases; emphasis on decision-making in a clinical practice. 4-week elective periods. Univ. Hosp.

387 **Subspecialty Diagnostic Radiology** (5) Staff

Subspecialty training in radiological diagnosis to prepare students for specialty medical training. Offerings include pulmonary, gastro-intestinal, urologic, obstetric and gynecologic, neurologic, and pediatric subspecialties. Prerequisite: permission of department. 4-week elective periods. Univ. Hosp.

389 **Diagnostic Radiology** (5) Staff

General radiography, fluoroscopy and nuclear medicine, special procedures, ultrasound and/or CT. Review and study of teaching image file. 4-week elective periods. Nat'l Naval Med. Center.

390 **Extramural Radiology Elective** (arr.)

The department arranges for students to spend elective periods at other institutions. Interested students should contact the chairman of the department.

391 **Diagnostic Radiology** (5) Schumacher and Staff

Same as Rad 389. 4-week elective periods. Wash. Hosp. Center.

Surgery

Chairman: P.C. Adkins

Directors of Divisions: P.C. Adkins *(Thoracic and Cardiovascular Surgery)*, P.E. Shorb, Jr., *(General Surgery)*, J.G. Randolph *(Pediatric Surgery)*, L.W. Thompson *(Plastic Surgery)*, R.D. Shapiro *(Oral Surgery)*

Professors P.C. Adkins, R.P. Altman, G.S. Letterman *(Plastic Surgery)*, L.T. Bowles, J.G. Randolph, P.E. Shorb, Jr., N.T. Tsangaris

Clinical Professors W.J. Fouty, E.A. Gould, G.A. Higgins, V.M. Iovine, N.H. Isaacson, M. Mills, J.R. Thistlethwaite, J.J. Weinstein

Associate Professors T.C. Alford, K.D. Anderson, H.E. Ashworth, G.W. Geelhoed, J.M. Giordano, F.M. Midgley, H.C. Pierpont, S.A. Rosenberg, L.W. Thompson

Associate Clinical Professors F.B. Brandt, J.W. Canter, J.M. Keshishian, S. Kirson, W.D. Latham, R.D. Ornitz, M.A. Schurter, C.A. Silva, N.P.D. Sny

Associate Professorial Lecturer L.E. Church *(Oral Surgery)*

Assistant Professors J.M. Ciaravella, R.C. Cochran, J.R. Fletcher, G.W. Gr ory III, C.A. Peck, Jr., L.E. Smith, D.L. Sturtz, H.H. Trout III

Assistant Clinical Professors E.J. Alpher, J.R. Appleton, R.R. Cameron, M Cohen, G.J. Collins, Jr., P.J. Corso, S.G. Crossland, R.L. Flax, B.F. Fran *(Oral Surgery)*, J.M. Garcia, J.M. Gitelman *(Oral Surgery)*, L.W. Gray, I. Harrison, S.M. Knoll, L. Kozloff, R.D. Kurstin, B.J. Levin, J.J. O'Conn N.A. Odyniec, L.R. Perna, F.F. Sacasa *(Oral Surgery)*, J.F. Schanno, Teunis, P. Zamick *(Plastic Surgery)*

Adjunct Instructor S.D. Pett

Clinical Instructors P.J. Galipeau, E.D. Hanowell, S. Holen *(Periodonti* C.L. Magassy *(Plastic Surgery)*, G. Rothman, J.H. Sager, R.S. Siegel *(O Surgery)*

Special Lecturers J.H. Bayly, R.N. Scott

302 **Clinical Clerkship in Plastic Surgery** (2)
Two-week elective periods. Univ. Hosp.

*303 **Clinical Clerkship** (10)
Eight weeks at Univ. Hosp. and Nat'l Naval Med. Center.

376 **Advanced Surgery** (5)
Participation in total patient care, including operative procedures und close supervision. 4-week elective periods arranged at affiliated hospita

378 **Intensive Care Unit** (5)
Introduction to the management of acutely ill surgical patients, includi cases involving trauma; neurosurgery; and cardiovascular-thoracic, abdom nal, and orthopaedic surgery. 4-week elective periods. Wash. Hosp. Cent

379 **Transplantation Immunology** (5)
Clinical renal transplantation and preservation. Daily teaching rounds, erature conference, seminar presentation, weekly surgical-medical nephro gy rounds. 4-week elective periods. Univ. Hosp.

382 **Hand and General Plastic Surgery** (5)
Participation in total patient care with emphasis on hand cases, but su plemented by other plastic and reconstructive cases. 4-week elective pe ods. Washington Hosp. Center.

383 **Endocrine Surgery** (5)
Management of endocrine disorders. Emphasis on control of hyperfun tion and neoplasms of the thyroid, parathyroid, adrenal and pancrea islet cell glands. Videotaped classic endocrine problems, library and la oratory research, and clinical exposure to surgical endocrinology. 4-we elective periods. Univ. and V.A. Hosp.

384 **Thoracic-Cardiovascular Surgery** (5)
Basic principles used in thoracic and cardiovascular surgery. 4-week ele tive periods. Univ. Hosp. and Clinic.

* Required for medical students.

385 **Plastic and Reconstructive Surgery** (5) Thompson

Preoperative and postoperative care, operating room procedures, clinical activities and conferences. Aesthetic surgery, head and neck cancer, maxillo-facial trauma, hand surgery, congenital anomalies. 4-week elective periods. Univ. and Children's Hosp.

386 **Pediatric Surgery** (5) Randolph

Participation in an active, closely supervised surgical service for infants and children, including congenital defects, cardiac surgery, trauma, and neoplasms. 4-week elective periods. Children's Hosp.

389 **Surgical Preceptorship** (5) Iovine, Thistlethwaite, Isaacson

Care of general surgical patients as seen in private practice. 4-week elective periods.

390 **Extramural Surgery Elective** (arr.)

The department arranges for students to spend one or more elective periods at other institutions. Students must have the approval of the chairman of the department.

391 **Special Programs** (5) Tsangaris

4-week elective periods. Univ. Hosp.

392 **Peripheral Vascular Surgery** (5) Keshishian, Smyth

Study and application of vascular surgery. 4-week elective periods. Wash. Hosp. Center.

393 **Burns** (5) Fouty

4-week elective periods.

394 **Peripheral Vascular Surgery** (5) Giordano

4-week elective periods. Univ. Hosp.

395 **Experimental Surgery** (5) Geelhoed

Research projects in surgical research laboratories employing animal models and experimental operative procedures in physiologic investigations. Emphasis on design of experiments, performance of experimental surgical techniques, precision in laboratory data gathering, and analysis of data. Areas of investigations include surgical endocrinology, transplantation and tumor immunology, shock metabolism, and gastrointestinal and cardiovascular physiology. 4-week elective periods.

396 **Peripheral Vascular Surgery** (5) Trout

4-week elective periods. VA. Hosp.

Urology

Chairman: H.C. Miller, Jr.

Professors A.B. Belman, L.R. Culbertson, H.C. Miller, Jr.
Clinical Professors E.E. Ferguson, F.J. Frensilli, W.D. Jarman, F.T. Reuter
Associate Professor H. Bensimon
Associate Clinical Professors W.L. Banfield III, M. Edson, H.A. Goldberg, J. Kenealy, B.T. Mittemeyer, C. Rodriguez, H.S. Semerdjian

Assistant Professors P.L. Gross, A.M. Kwart

Assistant Clinical Professors M.P. Berger, G. Dudas, W.L. Glover, Jr., F
Hendricks, H.J. Klapproth, G. Ottenberg, R.C. Rhame, H. Salcedo, D
Schwartz, D.M. Seitzman, I. Shuman, E.H. Soifer, I.J. Spence, R.E. Wa
I.S. Young

Clinical Instructors E.G. Abramson, J.B. Alperstein, B.O. Black, H.E. Bon
J.D. Francis, J.A. Gargurevich, S.O. Kazmi, M.I. Murdock, P.I. Shah, S
Werner

302 **Clinical Clerkship** (3) Miller, St
2-week elective periods. Univ. Hosp.

380 **Clinical Urology I** (5) Rea
Out-patient and diagnostic urology, cystoscopy, and radiographic pro
dures. 4-week elective periods. Univ. Hosp.

381 **Clinical Urology II** (5) Miller and St
Observation of urologic conditions and procedures for diagnosis and tre
ment; radiologic and pathologic studies, endoscopy and surgery, collate
reading, weekly staff conference. 4-week elective periods. Univ., V.A.
and Children's Hosps.

382 **Clinical Urology III** (5) Hendricks and St
Observation of urologic conditions and procedures for diagnosis and tre
ment, radiologic and pathologic studies, endoscopy and surgery, collate
reading, weekly staff conference. 4-week elective periods. V.A. Hosp.

383 **Clinical Urology** (5) Edso
Out-patient and diagnostic urology; cystoscopic and operative urology
week elective periods. Nat'l Naval Med. Center.

390 **Extramural Urology Elective** (arr.)
The department arranges for students to spend elective periods in other
stitutions. Interested students should contact the chairman of the depa
ment.

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES

Faculty and Staff of Instruction*

EMERITI

Theodore Judson Abernethy, *Professor Emeritus of Clinical Medicine*
B.S. 1925, Denison University; M.D. 1929, Johns Hopkins University

Errett Cyril Albritton, *Professor Emeritus of Physiology*
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Harry Ford Anderson, *Professor Emeritus of Dermatology and Syphilology*
M.D. 1924, University of Cincinnati

William Staton Anderson, *Professor Emeritus of Clinical Child Health and Development*
B.A. 1927, Duke University; M.D. 1931, Johns Hopkins University

Thomas McPherson Brown, *Professor Emeritus of Medicine*
B.A. 1929, Swarthmore College; M.D. 1933, Johns Hopkins University

Dexter Means Bullard, *Professor Emeritus of Clinical Psychiatry*
Ph.B. 1920, Yale University; M.D. 1923, University of Pennsylvania

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University

Jeremiah Keith Cromer, *Professor Emeritus of Clinical Obstetrics and Gynecology*
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Henry Lauran Darner, *Professor Emeritus of Clinical Obstetrics and Gynecology*
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*The Faculty and Staff of Instruction listed here and at the head of each department represents appointments current as of July, 1979. Faculty and staff members who hold appointments in two or more departments have the department of primary responsibility listed first.

Samuel Mayer Dodek, *Professor Emeritus of Clinical Obstetrics and Gynecol*
B.A. 1923, George Washington University; M.D. 1927, Thomas Jefferson University; M.A. 1
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mental)
B.A. 1927, Ph.D. 1933, Yale University

James Albert Dusbabek, *Professor Emeritus of Clinical Obstetrics and Gy*
cology
M.D. 1934, George Washington University

Clayton Bernard Ethridge, *Professor Emeritus of Medicine*
M.D. 1933, University of Virginia

James Joseph Feffer, *Professor Emeritus of Clinical Engineering and of Me*
cine
B.A. 1935, Indiana University at Bloomington; M.D. 1938, Indiana University at Indianapolis

Clarence Kendall Fraser, *Professor Emeritus of Clinical Obstetrics and Gy*
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Ph.B. 1931, College of the Holy Cross; M.D. 1935, Tufts University

James Quincy Gant, Jr., *Professor Emeritus of Clinical Dermatology*
B.A. 1930, M.S. 1931, Ohio State University; M.D. 1935, Medical College of Virginia
Virginia Commonwealth University

Robert Henry Groh, *Professor Emeritus of Clinical Neurology*
B.S. 1935, M.D. 1937, University of Pittsburgh

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Roy Hertz, *Professor Emeritus of Research Pharmacology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins
University

Robert Sexton Higdon, *Professor Emeritus of Dermatology and of Child Health*
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B.S. 1933, Millsaps College; M.D. 1937, Tulane University

Paula Reines Kaiser, *Associate Professor Emeritus of Anesthesiology*
M.B., Ch.B. 1936, University of St. Andrews, Scotland; M.D. 1937, State University of New
York

Hayden Kirby-Smith, *Professor Emeritus of Clinical Dermatology*
B.S. 1927, University of the South; M.D. 1937, George Washington University

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M.D. 1918, George Washington University

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B.S. 1913, Wake Forest University; M.D. 1915, Columbia University

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Margaret Mary Nicholson, *Professor Emeritus of Clinical Pediatrics*
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Jack William Andrews, *Special Lecturer in Radiology*

E. Katherine Koehler Andrus, *Lecturer in Pathology*
B.S. 1965, Wisconsin State University

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B.A. 1936, Ph.D. 1942, Harvard University

Raymond Walter Angel, *Special Lecturer in Health Care Sciences*
B.S. in Ed. 1964, Northern Arizona University

Tatiana Antonovych, *Professorial Lecturer in Pathology*
M.D. 1941, University of Vienna

Leonard Philip Appel, *Clinical Instructor in Medicine*
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James Richard Appleton, *Assistant Clinical Professor of Surgery (Plastic*
gery)
B.A. 1957, University of Iowa; M.D. 1961, University of Maryland

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B.A. 1965, University of Minnesota; M.D. 1969, Harvard University

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B.A. 1947, M.D. 1952, American University of Beirut; M.S. 1957, University of Iowa

Vernon W. Armbrustmacher, *Professorial Lecturer in Neurological Surgery*
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Susanne Russell Armstrong, *Clinical Instructor in Health Care Sciences*
B.S. 1962, Stanford University

Jerome Cayton Arnett, Jr., *Clinical Instructor in Health Care Sciences*
B.A. 1963, Bridgewater College; M.D. 1967, West Virginia University

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Sciences
B.A. 1969, Oberlin College; MD. 1973, Case Western Reserve University

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B.A. 1967, M.S. 1974, University of Texas at El Paso

Halbert Eugene Ashworth, *Associate Professor of Surgery*
B.A. 1956, Duke University; M.D. 1962, West Virginia University

Valerie Hornik Askanas, *Research Professor of Neurology*
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Philip Assatourians, *Assistant Clinical Professor of Medicine*
M.D. 1964, University of Tehran

Francis Bernard Atkins, *Adjunct Assistant Professor of Radiology*
B.S. 1968, Pratt Institute; M.S. 1971, Rutgers—The State University; Ph.D. 1978, University of Chicago

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Leon Stanley August, *Assistant Research Professor of Radiology*
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Gunter Josef Augustin, *Clinical Professor of Radiology*
M.D. 1952, University of Heidelberg

Gordon Avery, *Professor of Child Health and Development*
B.A. 1953, Harvard University; M.D. 1958, Ph.D. 1959, University of Pennsylvania

Benjamin Avrunin, *Assistant Clinical Professor of Health Care Sciences*
B.S. 1963, Georgetown University; M.D. 1978, Tulane University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1933, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

Silas Babin, Jr., *Assistant Clinical Professor of Medicine*
M.D. 1951, Louisiana State University, New Orleans

James Michael Bacos, *Professor of Medicine*
B.S. 1948, Virginia Polytechnic Institute and State University; M.D. 1953, Duke University

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B.S. 1955, Franklin and Marshall College; M.D. 1959, University of Pittsburgh

Alfred Baer, *Clinical Professor of Medicine*
B.A. 1942, Ohio State University; M.D. 1945, Johns Hopkins University

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John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

William Otis Bailey, Jr., *Associate Clinical Professor of Medicine*
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Alton Wade Baker, *Assistant Clinical Professor of Radiology (Nuclear Medicine Technology)*
B.A. 1964, David Lipscomb College; M.D. 1967, Medical College of Virginia of Virginia Commonwealth University

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Anne Hermine Baumhofer, *Assistant Clinical Professor of Pathology*
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Arthur Abbe Becker, *Associate Clinical Professor of Obstetrics and Gynecology*
B.S. 1956, City University of New York, City College; M.D. 1961, University of Iowa

Joan Alaine Becker, *Assistant Professor of Radiology (Allied Health)*
B.S. 1976, Ohio State University

Kenneth Louis Becker, *Professor of Medicine*
B.A. 1952, University of Michigan; M.D. 1956, New York Medical College; Ph.D. 1963, University of Minnesota

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B.S. 1971, Massachusetts Institute of Technology; M.D. 1974, Duke University

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B.A. 1943, Harvard University; M.D. 1947, Boston University; M.S. 1956, University of Minnesota

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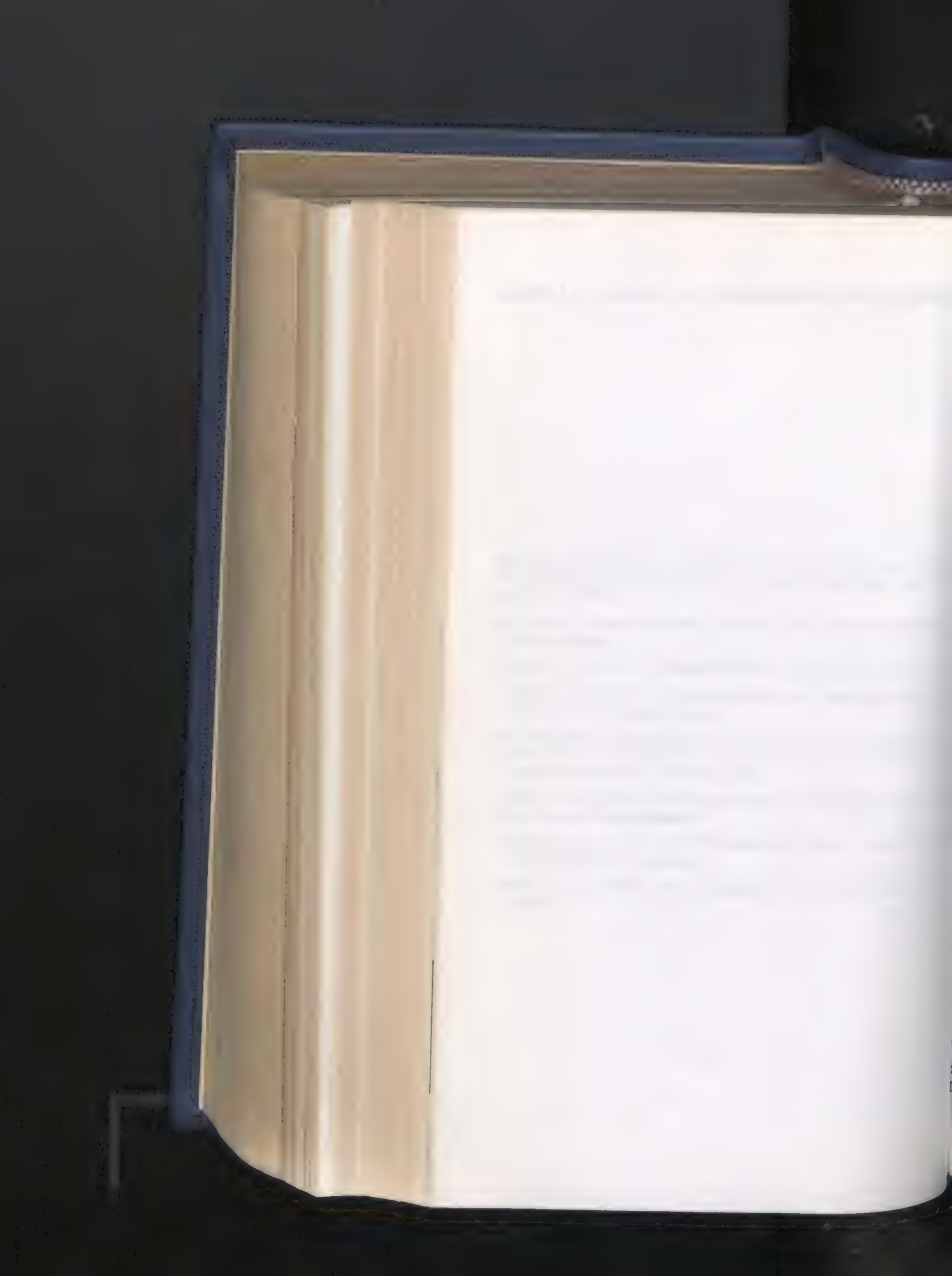
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of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of
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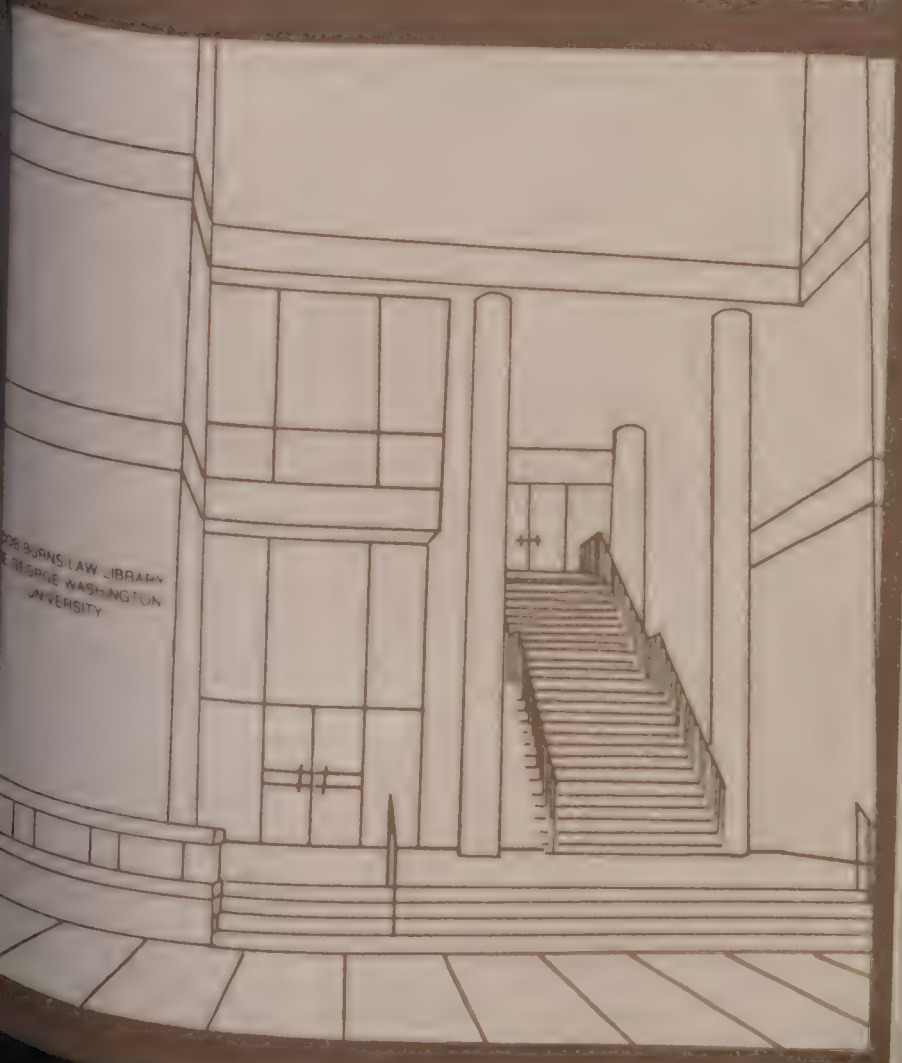
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1980-1981





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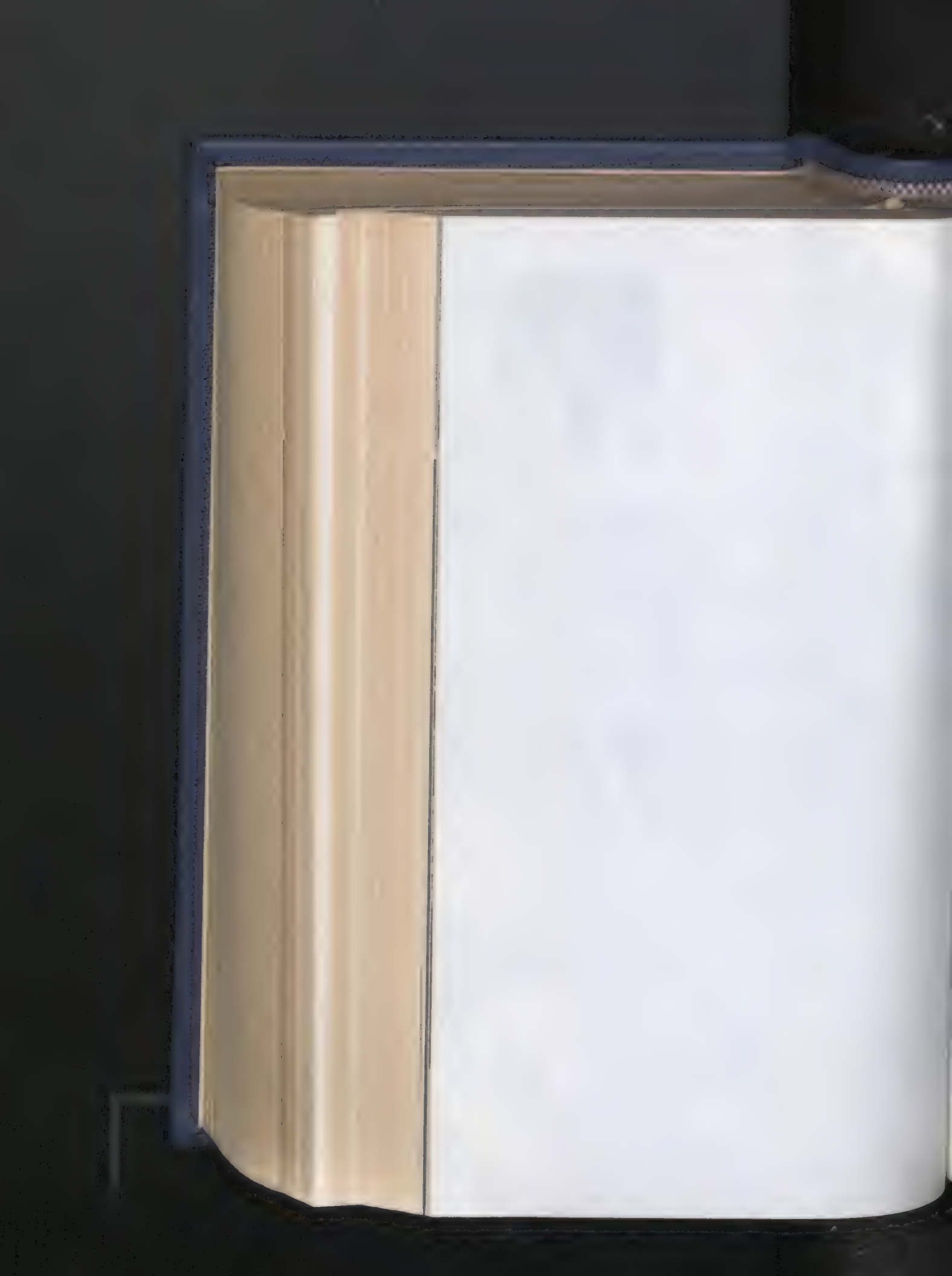
TO PROSPECTIVE STUDENTS.

This Bulletin of the George Washington University National Law Center contains general information about such matters as admission, registration, fees, and financial aid, as well as a listing of our faculty and courses of instruction. Our Bulletin requires considerable detail. We are one of the nation's large law schools. But, nonetheless, there always has been a tradition of friendliness among our students and an attitude of accessibility on the part of our faculty. If you are admitted to join us as first-year students, you will discover that the first-year life of the school is an intense one. Each of the sections into which the first-year class is divided becomes a little community of its own with a camaraderie and esprit de corps which will make that first year one of the most memorable of your lives.

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Jerome A. Barron

Jerome A. Barron
Dean



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1980 SUMMER TERM

May 19	Registration for all sessions *Monday* (noon–6:30 p.m.) Application for September 30 graduation due as part of registration
May 20	First-session and 13-week session classes begin *Tuesday*
May 26	Holiday *Monday*
June 30	First-session classes end *Monday*
July 1, 2, 3	First-session examination period *Tuesday-Thursday*
†*July 4*	Holiday *Friday*
July 7	Registration (9:30 a.m.–2 p.m. and 4–6 p.m.) and beginning of classes, second session *Monday* Application for September 30 graduation due as part of registration
August 15	Last day of classes *Friday*
August 18, 19, 20	Second-session and 13-week session examinations *Monday-Wednesday*

* This calendar is subject to change.

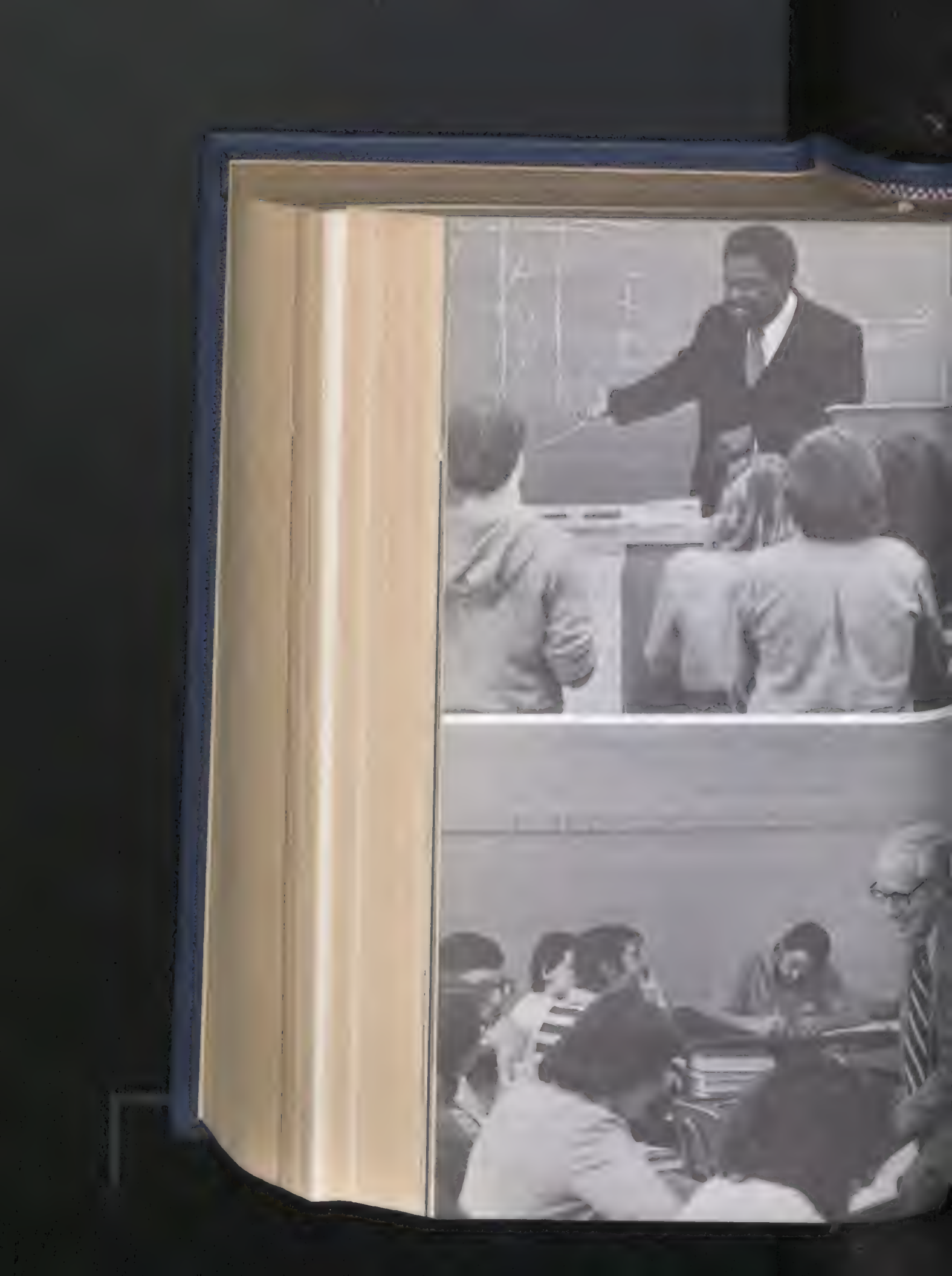
† Courses in the 13-week session will meet on their regularly scheduled days during the June 30, excluding the holiday on Friday, July 4.

1980 FALL SEMESTER

August 21–22 Registration *Thursday* (12:30-7 p.m.) and *Friday* (3-7 p.m.)
Application for February graduation due as part of registration
August 25 Classes begin *Monday*
September 1 Labor Day (holiday) *Monday*
October 10 S.J.D. dissertations of February candidates due *Friday*
November 26 Thanksgiving recess begins after last class *Wednesday*
December 1 Classes resume *Monday*
December 5 Last day of fall-semester classes *Friday*
LL.M. theses of February candidates dues
December 6–19 Reading and examination period

1981 SPRING SEMESTER

January 12–13 Registration *Monday* (12:30-7 p.m.) and *Tuesday* (3-7 p.m.)
Application for May graduation due as part of registration
January 14 Classes begin *Wednesday*
January 20 Inauguration Day *Tuesday* (Holiday)
January 30 S.J.D. dissertations of May candidates due *Friday*
February 16 Winter Convocation (holiday) *Monday*
March 2 Application for 1981–1982 teaching fellowships due *Monday*
March 21 Spring recess begins after last class *Saturday*
March 30 Classes resume *Monday*
May 4 Last day of spring-semester classes *Monday*
May 5–May 18 LL.M. theses of May candidates due
Reading and examination period
May 24 Commencement *Sunday*



THE NATIONAL LAW CENTER

HISTORY

THE LAW CENTER, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend George Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty which reflected the fact that it was at the seat of our nation's government. Associate Justices David J. Brewer and John Marshall Harlan of the Supreme Court of the United States were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, National University School of Law, which had an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. At present these include Taxation; Labor Law; Environmental Law; Patent Law; International and Comparative Law; and Government Contracts.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law program has been developed which is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the George Washington Legal Aid Bureau, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, taxation and government contracts, has developed a rich selection of courses, traditional and clinical, oriented toward the needs of the poor, the elderly, and the consumer.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any perso
basis of sex, race, color, religion, national origin, or handicap in any of
cation programs or activities. Federal regulations implementing Title I
Education Amendments of 1972 and Section 504 of the Rehabilitation
1973 call for an explicit statement that the requirement not to discrim
the basis of sex or handicap extends to employment in and admission
programs and activities. The University is also subject to the District
lumbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws a
lations concerning discrimination in education or employment progra
activities may be addressed to Marianne Phelps, Assistant Provost for
ative Action, Rice Hall, Washington, D.C. 20052, or to the Director
Office for Civil Rights of the Department of Health, Education, and

LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in t
tion's capital, the focal point of the law in action, both American and in
tional. The work of the Center goes on in this environment, present
unique opportunity for observation and study of federal agencies—judicia
islative, and administrative. Readily accessible are the Supreme Court
United States, the federal trial and appellate courts of the District of Co
and, in addition, federal courts of special jurisdiction, such as the United
Court of Claims, the United States Court of Customs and Patent Appe
Tax Court of the United States, and the Court of Military Appeals.
federal legislation can be studied as it is considered by Congressional co
tees and as it comes up for debate on the floors of the House of Repre
tives and the Senate. With respect to the federal administrative agencies
dents here in Washington have matchless opportunities for study and o
tion. They can attend informal and formal hearings of these agencies an
obtain from the docket sections complete records of administrative adjud
in specific cases. Illustrative of such federal agencies are the Interstate
merce Commission and the Civil Aeronautics Board in the field of trans
tion; the Federal Trade Commission in the field of trade regulation; the S
ties and Exchange Commission in the field of security issues and corp
finance; the National Labor Relations Board in the field of labor-manage
relations; the United States Patent Office in the field of patent law; the F
Power Commission in the field of water, natural gas, and electric power
the Federal Communications Commission in the field of radio and televi

Supplementing these environmental advantages of law in action are t
ceptional research library collections in the Library of Congress, in the
departments of the federal government, and in the libraries of the headqu
of national and international organizations. The notable library of the C
Foundation for International Peace has been acquired by George Wash
University for use of research students in international and comparative
fields with respect to which Washington has come to be called "The C
of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence, the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program in which students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club (a moot court competition); (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; (8) a continuing legal education program for members of the bar providing them with opportunities for course work within the curriculum; and (9) scholarly research and writing in the law.

The National Law Center Complex

The National Law Center Complex consists of three buildings: Stockton Hall, Bacon Hall, and the Jacob Burns Law Library.

STOCKTON HALL

Stockton Hall is the main classroom building. It also holds faculty offices and the offices of the Dean and the Associate Deans of the Law Center, as well as the Records Office and student lounges.

BACON HALL

Bacon Hall houses faculty offices; student lounges; the *George Washington Law Review* Office; the Government Contracts Program; the Admissions Office; the Law Center Placement Office; the offices of the *Journal of International Law and Economics;* the Black America Law Student Association; the New Students Civil Rights Research Council; the Van Vleck Appellate Case Club; the *Advocate*, the law school newspaper; the Student Bar Association; the Consumer Protection Center; the Legal Aid Bureau; and Movimiento Legal Latino, the national Latino law students association.

THE JACOB BURNS LAW LIBRARY

The Law Library of more than 240,000 volumes, including n holdings, is housed in the modern Jacob Burns Law Library Buildin ing Stockton Hall on the south side. This facility comprises nine floor levels with about 49,000 square feet of floor space. Its shelf capacit modates over 185,000 volumes; with supplementary shelving in Stock a small branch of the Law Library for the use of the *Law Review* Hall, and substantial storage space in Lisner Hall, the library provi for approximately 300,000 volumes. Seating for more than 500 r provided in four reading rooms, lounge areas, carrels, enclosed study semi-private reading alcoves, and seminar rooms.

The collections comprise a comprehensive working library of Angl can law, with supplementary material in related disciplines (such as finance, labor relations, sociology, criminology, political science, bi foreign affairs, and others). Special areas are maintained for collectio law, labor law, patent-trademark-copyright law, international law, and and comparative law. Included in the collections are the appellate dec all states courts and decisions of the federal courts, with comprehensiv tions of English and Canadian court decisions; the currently annotated of the 50 states; all federal statutes; English and Canadian statutes; statutes of other nations; and an extensive periodical collection, kept cu more than 1,300 subscriptions, covering virtually all American legal pe and most of those published in English throughout the world. The li strong in its treatise holdings, administrative and regulatory materials, a gressional coverage. The growing international law holdings include co of United Nations and European Economic Community printed mate recent material from the International Labor Organization, and curre retrospective collections of international treaties. A large portion of th ings of the former library of the Carnegie Endowment for International acquired by the University in 1950, is in the Law Library. A LEXIS t providing computer-assisted research capability, is available to studen faculty.

The Juris Doctor Degree Program

ENTRANCE REQUIREMENTS

For information on "Application for Admission" to the Juris Doctor program, see page 28. Admission to candidacy for the degree of Juris requires a Bachelor of Arts or equivalent degree from an accredited co university, a satisfactory quality of work, and an acceptable distribut courses. Any substantial number of hours taken on a pass-fail or c graded basis may be seriously detrimental to an applicant's chances mission. Eligibility is based on personal and scholastic records and co sult of the Law School Admission Test. Personal recommendations by th ty, as well as the benefits the school derives from social, ethnic, cultu geographical diversity among its students, are considered. No applicant acceptable in transfer who is ineligible to return in good standing fr

ously attended law school. From the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Admission Office of the National Law Center or from the Educational Testing Service, 20 Nassau Street, Princeton, N.J. 08540; or 1947 Center Street, Berkeley, Calif. 94704. The test is administered at various centers in the United States. Testing dates are usually in October, December, February, April, and June. Completed application forms and fees must be received by



the Educational Testing Service at least four weeks before the date of
It is not necessary that formal application for admission be made prior
ing the test.

ADVANCED STANDING

In unusual circumstances, advanced standing toward the degree of Juris
may be granted for work of high quality successfully completed in oth
schools which are members of the Association of American Law Sch
are approved by the American Bar Association. Transferred credits
be recognized in excess of those which might be earned in a similar pe
the National Law Center.

Advanced standing will not be granted for law work already counted
the Bachelor of Arts or other pre-legal degree.

TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for
gree of Juris Doctor must submit a tuition deposit ($100 initially pa
later) after receipt of notification of acceptance. This deposit is credited
tuition.

PROFILE OF THE ENTERING CLASS, FALL 1979

A first-year class of approximately 450 students was selected from mor
5,000 applicants from 730 colleges and universities. Applications were re
from every state in the union. Thirty-eight per cent of the first-year clas
women.

The following colleges and universities are each represented by three
members of the first-year class: American University, Boston University
deis University, Brown University, Bucknell University, Catholic Univ
America, City University of New York (Brooklyn College and Queens C
Colgate University, Columbia University, Cornell University, Dartmo
lege, Dickinson College, Duke University, Emory University, Fordham
sity, Franklin and Marshall College, George Washington University,
town University, Hamilton College, Harvard University, Haverford C
Johns Hopkins University, Marquette University, Miami University, M
State University, Northwestern University, Oberlin College, Ohio State
sity, Pennsylvania State University, Princeton University, Rutgers Uni
Smith College, Stanford University, State University of New York at
State University of New York at Binghamton, State University of New
Buffalo, Syracuse University, Temple University, Trinity College (Conn
Tufts University, Tulane University, University of California, Berkele
versity of Chicago, University of Connecticut, University of Denver, Un
of Florida, University of Hawaii, University of Illinois, University of M
University of Michigan, University of North Carolina, University o
Dame, University of Pennsylvania, University of Pittsburgh, Univers
Rochester, University of Texas, University of Utah, University of
University of Wisconsin, U.S. Military Academy, U.S. Naval Academy
College, Washington University, Wellesley College, Wesleyan Universit
liams College, Yale University.

HE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center ffers the candidate one of the largest and most varied selections of courses in he country. First-year students are required to take courses entitled Civil Pro- edure; Constitutional Law; Contracts; Criminal Law and Procedure; Legal Re- earch, Writing, and Professional Responsibility and Ethics; Property; and Torts. These courses give students the basis upon which all further legal study is uilt. In the second and third years of study, students must take Evidence nd fulfill a two-credit legal writing requirement. Beyond these requirements he students are free to choose from the many course and project offerings. The aw Center prides itself on allowing students freedom to design their own rogram of study.

The curriculum is organized so that students may begin the study of law for he Juris Doctor degree only at the start of the fall semester. Transfer students ay enter at the start of the spring semester also.

ay Division

irst Year

ALL SEMESTER		SPRING SEMESTER	
ontracts I			
orts	4	Contracts II	2
riminal Law and Procedure	4	Property	4
egal Research, Writing, and Profes-	4	Constitutional Law	4
ional Responsibility and Ethics	2	Civil Procedure	4
otal semester hours	14	Total semester hours	14

econd Year

ALL SEMESTER		SPRING SEMESTER	
ective	14	Evidence	4
		Elective	10
otal semester hours	14	Total semester hours	14

hird Year

ALL SEMESTER		SPRING SEMESTER	
ective	12	Elective	14
egal writing requirement	2		
otal semester hours	14	Total semester hours	14

his requirement may be satisfied by service on the *Law Review*, by service as an editor of the *rnal of International Law*, by satisfactory completion of a seminar which requires a research paper, participation in upper class Moot Court, or by satisfactory completion of Law 344, *Legal Writing*.

Evening Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	
Torts	4	Criminal Law and Procedure	
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	
Total semester hours	10	Total semester hours	

Second Year

FALL SEMESTER		SPRING SEMESTER	
Property	4	Constitutional Law	
Elective	6	Elective	
Total semester hours	10	Total semester hours	

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	8	Evidence	
*Legal writing requirement	2	Elective	
Total semester hours	10	Total semester hours	

Fourth Year

FALL SEMESTER		SPRING SEMESTER	
Elective	10	Elective	
Total semester hours	10	Total semester hours	

Summer Term or Ninth Semester

Elective	4

REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academ
(four years for evening students) and 84 semester hours of required a
tive courses, with a cumulative average of at least 65. At least one
year of residence and 28 semester hours are required of students admitt

* This requirement may be satisfied by service on the *Law Review*, by service as an
Journal of International Law, by satisfactory completion of a seminar which requires a
by participation in upper class Moot Court, or by satisfactory completion of Law 344

dvanced standing. The work of the final semester or summer session must be ompleted while in residence at the National Law Center. Credits allowed for dvanced standing are not included in computing the average required for raduation.

Graduation Requirements.—See pages 41–42 for a statement of the gradua-
on requirements.

esidence

andidates for the Juris Doctor degree must complete a residence period of hree academic years. Attendance in the day division for the fall and spring emesters constitutes residence for an academic year; similar attendance in the vening division constitutes residence for three-fourths of an academic year. onsequently, a day student must attend six semesters to meet residence re- hirements; an evening student must attend eight. Students authorized to take chedules of less than 10 hours in the day division or less than six hours in the vening division receive residence credit on a proportional basis. Students who ttend the summer sessions receive fractional residence credit.

ONORS

he degree of Juris Doctor "With Highest Honors" is awarded to those stu- ents, not exceeding three per cent of the graduating class, who have obtained he highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students ith the highest cumulative averages of 80 or better. The number of students eceiving degrees "With High Honors," when added to the total number of tudents receiving degrees "With Highest Honors," may not exceed 10 per cent f the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with e highest cumulative averages of 75 or better. The number of students re- eiving degrees "With Honors," when added to the total number of students eceiving degrees "With High Honors," and "With Highest Honors," may not xceed 40 per cent of the graduating class.

RDER OF THE COIF

he Order of the Coif, a national legal honor society, aims "to foster a spirit careful study and to mark in a fitting manner those who have attained a gh grade of scholarship." The George Washington University Chapter was tablished in 1926. Members are elected each year from the highest-ranking per cent of the graduating Juris Doctor candidates.

UBLICATIONS

he *George Washington Law Review*, published five times a year, is edited d managed by the students of the National Law Center. The *Law Review* known for its emphasis on federal and public law; however, it is also de-

voted to research in other important legal areas. The staff of the *L*
is selected on the basis of a writing competition and on the basis
The editorial board is selected from those students who have success
pleted the first year of *Review* work. Students receive 4 semester
academic credit for the two-year program.

The *Journal of International Law and Economics,* managed and
law students, is a biannual publication of the Law Center. It preser
and commentaries on public and private international financial dev
comparative law, and international law. The staff of the *Journal*
through a writing competition, and students earn academic credit
work.

MOOT COURT

The Van Vleck Appellate Case Club provides realistic training in appe
advocacy for students in the National Law Center. Each year two
tions are held: the upperclass competition is held in the fall and the
competition is held in the spring.

LAW CENTER ORGANIZATIONS

Black America Law Student Association (BALSA)

The Black America Law Student Association is a national Black law
organization which has chapters at some 80 law schools. BALSA spon
speakers and various programs.

International Law Society

The International Law Society is an organization of students interested
practice of international law. The Society sponsors speakers and vario
grams.

Movimiento Legal Latino

A national Latino law students organization which has chapters at vario
schools, Movimiento Legal Latino sponsors law speakers and various pro

Law Fraternities and Sororities

The chapters of Beta Kappa Pi, Delta Theta Phi, Phi Alpha Delta,
Delta Phi at the National Law Center sponsor speakers and various
occasions.

Law Students Civil Rights Research Council (LSCRRC)

The Law Students Civil Rights Research Council is a national organiza
law students concerned with the legal problems of civil rights. LSCRRC
clinical law projects for which students may receive academic credit.

National Lawyers Guild

The George Washington Chapter of the National Lawyers Guild is dedi
bring together those lawyers committed to broad issues of social reform

tudent Bar Association

he Student Bar Association is the law student governing body, responsible for llocating funds among the various student organizations. It also conducts a peaker program for the law school. All members of the student body are mem- ers of the Student Bar Association.

tudent Patent Law Association (SPLA)

he Student Patent Law Association, an organization of students interested in atent and related law, conducts an extensive speakers program as well as vari- us social events.

Women's Rights Committee (WRC)

The Women's Rights Committee is primarily interested in the place of women n law schools and in the legal profession. WRC conducts seminars and spon- rs speakers.



Joint Juris Doctor–Master's Degree Program

In certain instances, arrangements may be made for students to wor
rently toward both the Juris Doctor degree in the National Law Cen
Master's degree in some fields in the University's Graduate School of
Sciences, School of Government and Business Administration, or
Public and International Affairs. Fields in which this program is ava
clude Business Administration, Economics, International Affairs,
Science, Public Administration, and Public Affairs. Students must be
both to the National Law Center and, separately, to the School w
confer the Master's degree, and must meet all requirements in each de
gram. It is possible for a student to complete work for both degree
within four years.

Master's and Doctoral Programs

The administration of justice under law is a matter so vast and
that some who hold the Bachelor of Laws or Juris Doctor degree feel
for further study. The Master's and doctoral programs give students
portunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general
concentrate in one of the specialized areas listed below. Courses in
these areas are included in the 401–600 series. Graduates who comple
work in one of these areas may have the field of specialization noted
diplomas.

Administrative Law: Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Law and Poverty
Law, Psychiatry, and Criminology
Patent and Trade Regulation Law
Taxation
Urban Legal Studies

Programs leading to the degree of Doctor of Juridical Science offer
number of unusually talented advanced students, who have already ear
Master of Laws degree, the opportunity to concentrate on research and
in a specific area of interest to the legal profession.

MASTER OF LAWS

Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law
which is a member of the Association of American Law Schools or

proved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR* (Credit) in a course taken in other graduate divisions of this University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* (Credit) in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of 80 or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates admitted or readmitted after February 1976, or completing their degree requirements after February 1979. For candidates registered prior to February 1976, and continuously registered since, who receive their degree on or before February 1979, the minimum cumulative average is 75. The student is expected to include Law 599–600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see "Master's Thesis," below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field. Each Master of Laws program of study may include a limited number of courses numbered in the 300 series, with the approval of the Dean.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

MASTER'S THESIS

Each candidate for the degree of Master of Laws is expected to write a Master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for successful completion of the thesis. The purpose of this requirement is to demonstrate the ability of the student to perform research in a special area of the law and to produce a scholarly paper containing the results of this research. The thesis is expected to be of substantially the same quality as a Law Review article. The Dean may waive the thesis requirement upon written request of the student, submitted no later than the beginning of the *final semester* or *summer session* before the student's graduation, provided the student has

demonstrated research and writing ability by taking a minimum of
hours of course work at the National Law Center designated "Re
per." No thesis waiver is granted for candidates for the degree of
Laws with specializations in international law or government procure

The thesis in its final form must be presented to the adviser no
the date specified in the Calendar. Two complete copies are required
responsibility of the candidate to obtain from the Post-J.D. Progra
a printed copy of the regulations governing the styling and reproc
theses. The mandatory thesis binding fee of $15 must be paid at th
registration for the last semester's work.

Accepted theses become the property of the University and are
the University Library and the Law Library, where the duplicate
bound and made available for circulation.

Honors

The degree of Master of Laws "With Highest Honors" is awarded stu
obtain a minimum cumulative average of 85.

Graduate Courses in Other Departments

Master of Laws candidates may be permitted to take graduate course
to their fields of interest in other departments of this University. A ma
6 semester hours will be credited toward the degree for such courses;



redit will be granted only if the courses are given on campus. The grade of *R* (Credit) or *NC* (No Credit) will be recorded for such courses. Courses umbered 101–200 may be taken for graduate credit only if the student receives he approval of the instructor at the time of registration and does additional ork, as prescribed by the department offering the course.

onsortium of Universities of the Washington Metropolitan Area, Inc.

candidate for the Master of Laws degree may take graduate courses at eorgetown University Law Center through the Consortium of Universities of he Washington Metropolitan Area, Inc. A maximum of 6 semester hours of uch courses may be credited toward the degree. Permission to take Consor- ium courses must be granted by the Dean, the Registrar, and the instructor ffering the course. The grade of *CR* (Credit) or *NC* (No Credit) will be ecorded for such courses. To receive the grade of *CR* a student must attain a rade of *C* or higher.

OCTOR OF JURIDICAL SCIENCE

ntrance Requirements

dmission to candidacy for the degree of Doctor of Juridical Science requires Bachelor of Arts or equivalent degree from an approved college or univer- ity; a Bachelor of Laws, Juris Doctor, or equivalent degree, earned with high ank, from a law school which is a member of the Association of American aw Schools or is approved by the American Bar Association; a Master of aws degree with high academic standing; outstanding capacity for scholarly ork in the field of law; and faculty approval of the applicant's dissertation opic. Applicants must also demonstrate their writing ability by submitting the Master's thesis or a copy of one or more papers or articles which the applicant as written. Following consultation with the Dean, the applicant must obtain faculty adviser, to be designated "committee chairman," from the regular, ull-time faculty; reach agreement on the acceptability of the proposed topic or the dissertation; and submit a detailed outline for the adviser's approval, ndicating by chapter and division within chapter the exact scope of the roject. There should be a bibliography for each chapter, listing books, re- orts, cases, and law review articles to be considered. Although the outline annot predict every detail of the subsequent research, it must be sufficiently efinite to afford the Graduate Board a basis for evaluation.

Once the outline is approved, the applicant's "committee" is expanded to hree members; this consultative committee must recommend the acceptance f the applicant to the full Graduate Board. The Board then acts upon the ecommendation and may either accept or reject the applicant as an S.J.D. andidate. In no instance will any applicant be admitted to degree candi- acy prior to the above procedures; however, the applicant may be registered as n Unclassified Student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the ap- ointment of an adviser unless a written extension is granted by the Dean.

egree Requirements

he candidate must complete (1) a residence period of not less than one aca- emic year; (2) a course of study and research—designated by the consulta-

tive committee and approved by the Graduate Board—of no less semester hours including *Jurisprudence,* unless previously taken; and acceptable dissertation. The dissertation must be submitted no later th years from the date of admission to candidacy for the S.J.D. degr applicant who proposes to write on a comparative law topic must reading knowledge of the language in which the relevant materials a found. When the dissertation is submitted, the consultative committee the date for an oral examination. This examination is conducted by sultative committee and such other members of the faculty and qual perts as are selected by the Graduate Board.

No later than the date specified in the Calendar (see page 5), the c must submit to the Dean two complete copies of the dissertation and tw of an abstract (not to exceed 600 words) of his dissertation.

Printed copies of detailed regulations regarding the form and reprodu the dissertation and preparation of the abstract are available in the O the Dean. To be acceptable the dissertation must, in the opinion of th ining committee, constitute a substantial contribution to the field of la cerned and be suitable for publication. Additional information will be g by the Dean. Accepted dissertations become the property of the Un and are placed in the University Library and the Law Library, wh duplicate copies are bound and made available for circulation.

Degree Programs for International Students

The National Law Center has several programs of study available to s trained in law outside the United States. These programs fall into two g categories: (1) those directed toward preparing students for a bar exa tion in an American jurisdiction and (2) those that enable students to to their countries with a more thorough understanding of some aspe American law.

A student with a degree from a foreign law school who has met the ex competitive admissions criteria will be admitted to the Center as a can for the Master of Comparative Law (Foreign Practice) (M.Comp.L Prac.]) or Master of Comparative Law (American Practice) (M.Comp.L Prac.]) degree.

To prepare for admission to the bar of an American jurisdiction, the may apply for either the Juris Doctor or the Master of Comparati (American Practice) degree. The J.D. degree requires 84 semester ho work in law school (credit is given for work in a foreign law school on ceptional circumstances) and will qualify the student to take most U examinations. The M.Comp.L.(Am.Prac.) degree requires 32 semeste of work and satisfies the requirements of the District of Columbia Bar. *are cautioned to ascertain the requirements of the bar for which they qualify prior to selection of their law school programs.*

Foreign students planning to return to their home countries may und program leading to the degree of Master of Comparative Law (Foreign tice). This degree program enables the student to gain a broader compre of the American legal system by taking basic courses in the Law Center ever, it is not intended to qualify a student to take a U.S. bar exam



ADMISSION PROCEDURE

Application must be received from *foreign applicants* no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), November 1 for the spring semester, and March 1 for the summer sessions.

Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended are required, but in exceptional cases certified copies will be accepted. Records of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 550 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English*

as a Foreign Language does *not* constitute application for admission t
Washington University.

The Bulletin of Information, obtainable without charge, contains
tion of the test as well as rules regarding application, fees, reports,
conduct of the test; lists of examination centers; examination dates
application blank. On the application for the test, the student shoul
that the scores be sent to the Dean's Office.

ENTRANCE REQUIREMENTS

For the Degree of Juris Doctor.—Entrance requirements for foreign
are the same as those stated on pages 10–12, except that advanced st
rarely granted for study in foreign law schools.

*For the Degrees of Master of Comparative Law (Foreign Practice) a
ter of Comparative Law (American Practice).*—The entrance requirem
the successful completion of and graduation from a course in arts, phil
letters, or sciences, equivalent to graduation from a gymnasium, lycee,
and graduation in law with high academic standing from a recognized
university.

For the Degree of Master of Laws.—A foreign student will only
sidered for admission to the Master of Laws program if he or she has
doctor or post-juris doctor degree in law with high academic standin
an American university.

For the Degree of Doctor of Juridical Science.—The usual entra
quirements are the successful completion of and graduation from a co
arts, philosophy, letters, or sciences, equivalent to graduation from a g
sium, lycee, or liceo; graduation in law from a recognized foreign uni
outstanding capacity for scholarly work in the field of law; and a Ma
Laws degree with high academic standing from an American university.

DEGREE REQUIREMENTS

Juris Doctor, Master of Laws, Masters of Comparative Law, and *Do
Juridical Science.*—Degree requirements for foreign students are the s
those stated on pages 14–15, 19–20, and 21–22.

Master of Comparative Law (Foreign Practice).—The student must co
a residence period of not less than two semesters, which should be conti
All requirements for the degree must be completed in a period not ex
three years from the time of registration for the degree. The student must
plete satisfactorily 24 semester hours of approved courses of the Center
such other departments of the University as the faculty of the Center sha
prove, and must maintain a cumulative average of at least 55. A cum
average of 65 is required for those admitted after the spring semester

Master of Comparative Law (American Practice).—The requirements
this degree are the same as those for the degree of Master of Comparative
(Foreign Practice) except that this degree requires 28 semester hours of
work with a cumulative average of at least 65. For those students adm
for or after the 1979 Fall semester, 32 semester hours of course work
cumulative average of at least 65 will be required.

Unclassified Students

Two types of students may be admitted to the National Law Center as Unclassified Students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above-average record at another law school which is a member of the Association of American Law Schools or is approved by the American Bar Association may, at the discretion of the Dean, be admitted as an Unclassified Student to earn credits for transfer to the other law schools. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

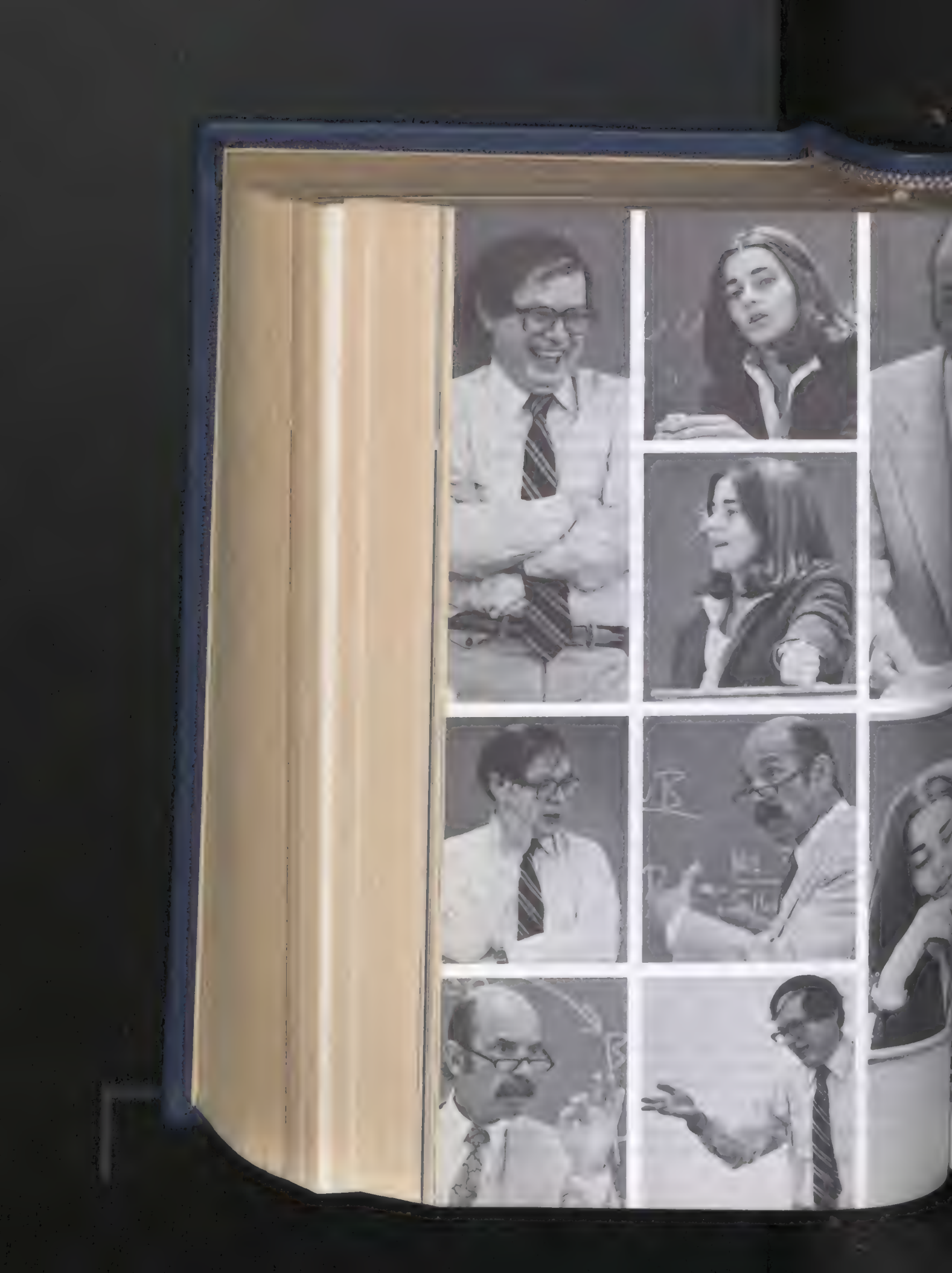
2. Graduates of law schools which are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as Unclassified Students.

Unclassified Students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an Unclassified Student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

Continuing Legal Education

Members of the Bar wishing to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)



GENERAL INFORMATION

The National Law Center has an enrollment of about 1,700 for the J.D. and Post-J.D. degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 400 are enrolled in the part-time evening division. Three hundred students, many from abroad, are enrolled in the Post-J.D. degree programs.

DAY AND EVENING CLASSES

Day classes meet in the mornings in 50-minute periods and in the afternoons in 50-minute periods and also in sessions of two 50-minute periods, Monday through Friday. Trial Practice Court and certain other courses meet for two-hour periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A four-credit course, e.g., Evidence, meets two evenings a week; a three-credit course, e.g., Administrative Law, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., Contracts II, meets one evening a week. The evening division conforms to the standards of the day division, the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be given in the evening.

SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year, and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each session by day students. Day students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by evening students. Evening students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

Admission

Applicants are urged to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process, there is no discrimination against any applicant because of sex, race, color, religion, handicap, or national origin. An application fee of $25 for a degree candidate ($5 for an unclassified student) must accompany the application.

Forms for application for admission or readmission are avail
should be returned to the Office of Admissions of the National
George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institution
22–24.

APPLICATION FOR ADMISSION

Juris Doctor Program.—Beginning students are admitted only at
the fall semester.

The applicant should register with the Law School Data Assem
(LSDAS) by completing and mailing the registration form supplie
application blank. No application to this school will be processed
companied by a Law School Application Matching Form, which
each applicant's LSAT/LSDAS registration packet. Since an LS
LSDAS report cannot be produced by Educational Testing Service
Matching Form, it will be necessary to return to the applicant any
received without it. A transcript from each college or university atte
then be sent directly to LSDAS, Educational Testing Service, Box 9
ton, New Jersey 08540. No transcript should be sent to the Na
Center. The LSDAS will analyze the transcript and send a copy
school and others designated on the registration form. If the transc
has been forwarded to LSDAS does not show evidence of receipt o
lor's degree, the applicant will be asked, upon acceptance, to subm
transcript directly to the National Law Center.

To provide time for the evaluation of credentials of beginning st
papers, including the Law School Admission Test score, should be r
the National Law Center before March 1. This means that the Octob
cember Law School Admission Test should be taken (see "Entrance
ments," page 11).

All papers of transfer students should be received by the Admissi
no later than June 2 for the fall semester, December 3 for the spring
May 1 for the first summer session, and June 2 for the second sum
sion.

For additional information, see the official *Pre-Law Handbook*, 19
edition, available in October 1980, and prepared by the Law School A
Council and the Association of American Law Schools. This book
material on the law and lawyers, pre-law preparation, applying to law
and the study of law, together with individualized information on mos
can law schools. It may be obtained at college bookstores or order
Educational Testing Service, Princeton, New Jersey 08540.

Master's and Doctoral Programs.—Students are admitted at the begi
the fall semester, the spring semester, or any of the summer sessions.

Application for admission, together with all required credentials,
received by July 1 for the fall semester, November 1 for the spring
ter, and one month prior to registration for the summer session for wh
plication is made.

Unclassified Students.—Lawyers who wish to take graduate cour
admitted at the beginning of the fall semester, the spring semester, or
the summer sessions. Students who wish to earn credits for transfer

achelor of Laws or Juris Doctor degree at another institution may be admitted the summer sessions if they are students in good standing at an accredited w school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who fishes to earn credits for transfer toward a Bachelor of Laws or Juris Doctor egree at another law school (see page 25), should be received at the Office of dmissions of the National Law Center at least one month prior to the first day f registration for the semester or summer session for which application is ade.

2. Application for admission, with required credentials, for lawyers who wish take graduate courses (see page 25), should be received at the Office of Adissions of the National Law Center by July 1 for the fall semester, November for the spring semester, and one month prior to registration for the summer ssion for which application is made.

EADMISSION

student who was previously registered but did not attend during the most cent semester (summer term excluded) should file an application for readission. Closing dates for readmission are the same as those for admission ee "Application for Admission," page 28).

If the student has attended one or more higher institutions during his abnce from the University or if he applies as a degree candidate and was previously a nondegree student, he must have complete, official transcripts sent to e Dean.

egistration

efore attending classes each student must register in person. No student will registered until proper credentials have been filed and approved (see "Admission").

No registration is accepted for less than a semester or one summer session.

A student may not register concurrently in George Washington University d another institution. Registration in more than one college, school, or divion of the University requires the written permission of the deans concerned, *ior to registration.*

LIGIBILITY FOR REGISTRATION

student who is suspended or whose record is not clear for any reason is not igible to register.

New Student.—Upon receipt of a *final letter* of admission a new student is igible for registration on the stated days of registration.

Readmitted Student.—A student previously registered who was not registered or courses during the preceding semester or summer session must apply for nd receive a letter of readmission (see "Readmission," above) before becomng eligible for registration.

DATES AND PLACE OF REGISTRATION

Registration is held in Stockton Hall, 720 Twentieth Street, N.W., C
following periods: *fall semester,* August 21 and 22; *spring semester*
12 and 13.

A late-registration fee of $15 is charged each student who is pe
register after the regular registration days.

Registration may be changed only with the permission of the Dean.

Fees and Financial Regulations

The following fees and financial regulations were adopted for the 1980
sessions and the academic year 1980–81. (See below for the projecte
and fee increases for 1981–83.)

Tuition Fees

For all students except Doctor of Juridical Science candidates:
- Full-time program (11 or more hours*), each semester .....
- Part-time program, each semester hour .....

Doctor of Juridical Science candidates,† including the final examination ....

University Center Fee (charged all students registered on campus)

For students registered for 11 or more semester hours:
- Each semester .....

For students registered for less than 11 semester hours:
- Each semester hour for which the student registers .....

Energy Surcharge (charged all students registered on campus)

For students registered for 11 or more semester hours:
- Each semester .....

For students registered for less than 11 semester hours in a semester:
- Each semester hour for which the student registers .....

Graduation Fee .....

Special Fees

Application fee (degree candidate), nonrefundable .....
Application fee (unclassified student), nonrefundable .....
Application fee for room reservation, nonrefundable .....
Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission, $350 by June 2) .....
Fee for binding Master's theses and S.J.D. dissertations .....
Late-registration fee, for failure to register within the designated period ....

* With the prior permission of the Dean, a J.D. degree candidate may take more than
hours after the first year of study.

† The tuition fee is to be paid at the rate of $1,175 per semester for four successive
clusive of the summer term or terms. If the Faculty should approve an extension of time
must maintain continuous enrollment.

ate-payment fee, charged for failure to make payments when due (see "Payment of Fees," below)	
eplacement of lost or stolen picture identification card	15.00
inancial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below)	2.00
eturned check fee, charged a student whose check is returned because of insufficient funds or for any other reason	35.00
ranscript fee, for each transcript of record	15.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	2.00
	.50

egistration on campus in the University entitles each student to the following rivileges: the services of the Student and Alumni Career Services Office; the use of the University Library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; subscription to the *University Hatchet*, the student newspaper; admission to University debates; medical attention as described under Student Health Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

ROJECTED TUITION AND FEE INCREASES 1981–83

n order that students may plan realistically, tuition increases for the academic ears 1981–82 and 1982–83 have been estimated as follows:

ncrease by year (full-time students):

1981–82	$500.00
1982–83	600.00

ncrease by semester hour (part-time students):

1981–82	20.00
1982–83	25.00

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

AYMENT OF FEES

o student is permitted to complete registration or attend classes until all harges are paid. Tuition and fees for each semester are due and payable in ull at the Office of the Cashier at the time of each registration. Checks and ostal money orders should be made out to George Washington University with udent identification number shown in upper left hand corner.

The Student Accounts Office has responsibility for billing and maintaining udent accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment

hese yearly increases are also projected for the total fee for work leading to the degree of Doctor Juridical Science.

contract with the Student Accounts Office at the time of each registrati
mitting them to pay one-half of the total tuition and fees (except for f
able in advance) at the time of registration and the remaining half on o
Wednesday of the ninth week of classes for the fall and spring se
Interest at the rate of 8 per cent per annum on the unpaid balance
charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, gove
tuition contracts, or other forms of tuition awards are not permitted
deferred payment contracts unless the total tuition and fee charges ex
value of the tuition awards by $1.100 or more. Under such circum
the student may be permitted to pay one-half of the amount due fr
student at the time of registration and to defer the balance by signi
ferred payment contract.

Students who fail to make any payment when due will be autom
charged a $15 late-payment fee and will be subject to the interest cha
per cent per annum. Accounts which become 30 days past due will b
cially encumbered. In the event a student's account is financially encu
the student forfeits his right to the use of deferred payment contracts in
semesters, and the Student Accounts Office will notify the Registrar to w
grades, future registration privileges, transcripts, diplomas, and other
information until the account is settled financially. Financial settlement
quire payment in full of all amounts due the University in addition to
cial reinstatement fee of $35.

Returned Checks—A student whose check is returned unpaid by th
for any reason will be charged a returned check fee. If the check is n
within 15 days, the student will forfeit all rights to check cashing at
versity, and future payments for tuition, dormitory, food service, and
special fees will require payment by cash, certified check, or money

PREPAID AND DEFERRED PAYMENT PLANS

Several commercial programs for those who wish to pay for colleg
monthly basis are available. Terms and conditions vary, but most pro
life insurance policy in the contract. For specific details and applicatio
dress inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia
19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James A
Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a
of applications for these various programs, but will be happy to provid
ance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in clas
ule must be made in person or in writing to the Dean. Withdraw

* No refund of the $100 deposit required of entering students is granted. Regulations cover
drawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of*

ourses is permitted after the midpoint of a semester only in extraordinary cir-umstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semester ition charges and fees will be made in accordance with the following sched-e for the fall and spring semesters:

Complete withdrawal from the University:

Withdrawal on or before Saturday of the first week of classes 90%
Withdrawal on or before Saturday of the third week of classes 75%
Withdrawal on or before Saturday of the fifth week of classes 50%
Withdrawal after the fifth week of classes .....None

For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the differ-ence between charges for the original program and the adjusted charges for the revised program.

A student enrolled in a full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.

Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for re-unds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from asses.

Authorization to withdraw and certification for work done will not be given student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make anking arrangements in the community.

inancial Aid

he National Law Center has been able in recent years to assist many stu-nts in obtaining the financial aid they require, through full or partial schol-ships, various loan programs, part-time employment, or a combination of ese kinds of assistance.

RADUATE AND PROFESSIONAL SCHOOL INANCIAL AID SERVICE

e National Law Center participates in the Graduate and Professional School nancial Aid Service (GAPSFAS), which provides an analysis of an applicant's ancial needs. Entering students wishing to receive financial aid should request e materials from GAPSFAS, Education Testing Service, Box 944, Princeton, w Jersey 08540. The information provided by the applicant and the appli-nt's parents will be analyzed, and a copy of the report will be sent to the w Center. In addition, students entering the National Law Center who desire

to be considered for a scholarship must submit a letter to the Law Cent March 1 outlining their academic qualifications, their extracurricular act and their reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in t their reports to be received at the Law Center as early as possible sin Committee on Student Financial Aid of the Center will begin making in March, and available funds are limited.

No awards will be made to an entering student until the admission has been completed.

JURIS DOCTOR PROGRAM

Scholarships and Research Assistantships

Application and correspondence concerning scholarships and research tantships should be sent directly to the Dean. Unless otherwise specified cation and supporting credentials should be submitted no later than M preceding the period for which the award is made.

Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973).—Scholarsh for needy law students from the Washington, D.C., area.

Mildred Gott Bryan Scholarship Fund (1965).—Partial scholarship students in the National Law Center.

Charles Worthington Dorsey Memorial Scholarship (1947).—Mem Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition ship for the course leading to the degree of Juris Doctor, awarded to and promising graduate of this University with a Bachelor of Arts or lent degree. Ordinarily this scholarship is awarded once every three y

Honor Scholarships.—Two scholarships available each year to students ing upon full-time study. Each scholarship provides a cash award, in to tuition aid, in an amount depending on need, for all three years scholarships are awarded on the basis of outstanding college records, both demic and extracurricular; Law School Admission Test scores; and ne retain the scholarship for the second and third years, the candidate maintain a *B* average, both for each year and cumulative.

Law Center Tuition Remission.—For Juris Doctor students, based nancial need.

Phi Delta Delta Scholarships (1959).—Zeta Chapter of Phi Delta Delt Fraternity (International), provides tuition aid to a student in the seco of the Juris Doctor program who excelled in scholastic achievement and to the Center in the first year.

Vernon Romney Scholarship Fund (1977).—To provide a scholar some worthy student in the Law School.

Trustee Scholarships.—Scholarships awarded each year to entering students, for tuition aid, in amounts depending on need. Candidates demonstrated qualities of leadership, in addition to scholastic attainme retain the scholarship, the successful candidate must maintain a *B* averag for each year and cumulative. Application must be made to the Dean March 1.

Tuition-aid scholarships are also available to continuing second- and year full-time students with demonstrated scholastic ability, on the b financial need and capacity for leadership. Application should be made Dean prior to June 1.

Frank S. Whitcomb Scholarship Fund (1971).—Bequest of Frank S. Whitcomb for the purpose of aiding and assisting worthy young men and women in securing a legal education.

Graduate Fellowship Information Center.—Students may also wish to visit the Graduate Fellowship Information Center (2025 H St., N.W.) for additional information on fellowships and grants.

Loan Funds

Through the generosity of friends of the University a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert M. and Mary McConnel Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the J. Forrester Davison Loan Fund; the District of Columbia Bar Association Loan Fund; the J.W. Ehrlich Foundation Loan Fund; the Newell W. Ellison Loan Fund; the Harold L. and Violet George Foundation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Jephson Educational Trust Loan Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Johnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Loan Fund; the Phi Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the H. William Tanaka Law Students Assistance Loan Fund; the Orville Hassler Wallern Memorial Loan Fund; the W.H. Williams Memorial Student Loan Fund; the Ruth F. Wilson Loan Fund; and the Yadao and Kanemoto Loan Fund.

In addition, financial assistance is available through the Guaranteed Student Loan Program, National Direct Student Loans, and other sources.

Application for financial assistance should be made in the Office of the Dean.

MASTER'S AND DOCTORAL PROGRAMS

Fellowships and Scholarships

Application should be made before March 1 preceding the period for which the award is made. The applicant should submit an application for admission as a degree candidate and a personal letter applying for a fellowship to the Dean. The letter of application should contain complete biographical data, information as to experience in practice or teaching, and copies of or citations to published legal writings, and such other information the student believes will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of their law faculty directly to the Dean. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

Food and Drug Law Graduate Fellowship.—Sponsored by the Food and Drug Law Institute. A stipend of $10,000 will be available in 1980–81 to advance a fellowship in Food and Drug Law. The academic work under this

Fellowship leads to receipt of a general, undesignated Masters degree designated Masters degree in Administrative Law: Economic Regu Patent and Trademark Law, on the satisfactory completion of 24 credi of approved work. A thesis of publishable quality will be a mandatory re ment for the degree, as well as a minimum two hours per semester of work in food and drug practice in the Law Center's clinical program the supervision of a faculty advisor.

Marcus B. Finnegan Memorial Fellowship.—Established in memory of cus B. Finnegan, LL.M. '57, who, as an alumnus, lawyer, and teacher, distinction to the field of patent law. The Fellowship was established with generous gifts by Mr. Finnegan's law firm, Finnegan, Henderson, Garrett & Dunner, his clients, and his many friends. The income from lowship is used to finance a Graduate Fellowship in Intellectual Prope a requirement that the recipient of the Fellowship prepare a publishab in the field of international intellectual property.

Richard Paul Momsen Scholarships for Brazilian Graduate Law Stu Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1978–79 and nate years, for the study of U.S. constitutional law and the law of pate trademarks.

Teaching Fellowships.—Three or four fellowships available each year stipend of $8,000 plus tuition for an approved course of study leading advanced degree. Teaching fellowships are awarded for a term of tw demic years. Fellows conduct the first-year course in Legal Research and ing and work with the students to improve their legal writing abili arrangement with the Dean, they may also be given the opportunity to additional courses.



Prizes

Jacob Burns Prize.—Established by Jacob Burns, a law alumnus and Trustee of the University. A medal and $100 awarded annually to each of the two members of the winning team in the upperclass Van Vleck Moot Court competition.

Ogden W. Fields Graduate Prize.—Fifty dollars awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

Charles Glover Prize.—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. Consists of selected law books. Awarded annually to the student who has attained the highest average grade in the third-year, full-time course.

Kappa Beta Pi Prize.—Awarded by Eta Alumnae Chapter to the law student who attains the highest average for the first year.

John Bell Larner Prize.—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course for the degree of Juris Doctor.

John Ordronaux Prizes.—By bequest, $75 awarded annually to the student who has attained the highest average grade in the first-year, full-time course; and $75 to the student who has attained the highest cumulative average grade at the end of the second-year, full-time course.

United States Law Week Award.—Presented to an outstanding senior law student.

Jennie Hassler Walburn Prize.—A cash reward to the outstanding student in the field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

Regulations

ACADEMIC WORK LOAD

Juris Doctor Candidates.—Juris Doctor candidates without substantial outside employment may take a program of studies of 14 hours a week. Such students may take courses in the evening only if they are not scheduled in the day-time and if a majority of the hours taken are in day courses. The Dean is authorized to approve programs of study of more than 14 hours in exceptional cases; however, no program will be approved which would permit the student to complete requirements for the degree in less than 28 months after beginning the first year of law study. Students with more than 15 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week; the minimum load is 8 hours, except in special cases where 6 may be approved by the Dean for a limited time. A minimum schedule of 11 hours in the day division is required except in exceptional circumstances when a reduced program is authorized by the Dean.

Students taking more than 8 hours in the day division or 4 hours evening division must have the permission of the Dean to take a Bar course.

Students may transfer from the day division to the evening divisio with the permission of the Dean.

With the approval of the Dean, second- and third-year students may maximum of 6 semester hours of appropriate courses in other departm the University; such a student must receive a grade of at least *B* to obta for such courses, and in no event will the grade count in computing the lative average.

Master's Candidates.—Master's candidates without substantial outsi ployment may take a maximum of 12 hours a week. Students with mo 15 hours of outside employment must take a limited program of study exceed 8 hours a week. The minimum load is 4 hours unless appro fewer hours is given by the Dean for a limited time.

ATTENDANCE

Regular attendance at classes is required and is necessary for successful A student who is deficient in class attendance in any course may be from taking the examination.

CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another same course without the approval of the Dean. Students may drop only with the written approval of the Dean. In addition, approval of structor is ordinarily required unless the request is made early in the se Under no circumstances may any student drop a course after the last classes in any semester or summer session.

RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examinat seminars and in other courses, as indicated in the course descriptions research paper must be submitted by the first day of the examination (the first day any examination is given in any course). For sufficient the instructor may extend the time beyond this date to a later date later than the last day of classes of the following semester, or without permission of the Dean, not later than the normal graduation date for dent), subject to the following conditions: (1) no student will receive a for the course for any purpose until a paper acceptable to the instruc been submitted; (2) if a paper is submitted after the last day of exam (or the last Wednesday before registration for the spring semester), the grade the student may receive for the course is *CR* (Credit) or *NC* Credit), except that failure ultimately to submit any paper for the cour result in a grade of 45. Students who are candidates for the J.D. degree register for one course requiring a research paper in each semester third year; with the approval of the Dean such students may register for than one such course each semester. Approval of the Dean is required second-year students to take such courses.

EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a make-up examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit, or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.

CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a Credit/No Credit basis, 12 semester hours of elective course work on a Credit/No Credit basis, and will receive a grade of Credit if the course is satisfactorily completed with a grade of 65 or better. No student may change from a numerical grade to a Credit/No Credit basis in a course during the last four weeks of classes except with the permission of the instructor. An unexcused failure to take an examination in a course or failure to submit a required research paper will result in the recording of a grade of *F* for a course taken on a Credit/No Credit basis.

No student may take more than 17 semester hours of courses (including Law 399) and other courses regularly given on a Credit/No Credit basis) on a Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to take courses on a Credit/No Credit basis. In the opinion of the faculty, a student's election to take courses on a Credit/No Credit basis may, in view of the importance apparently attached to grades by educational institutions and employers, be detrimental to the student's career in the legal profession.

GRADES

Grades are given in numerical terms equivalent to letter grades as follows: 85–100, *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poor (below standard for graduation: 45–54, *F*, Failure. In Law courses 220, 321–323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, and 593 grades are

CR, Credit (minimum grade of 65 required for J.D. candidates, quired for LL.M. candidates); *NC*, No Credit. A student who has b cused from taking a regularly scheduled examination is given the gra Incomplete. See "Examinations" (page 39) for grade upon failure to examination. Grades between 55 and 100 indicate that the work h completed and credit given. Grades between 55 and 64, however, do n sent satisfactory work and adversely affect a student's cumulative aver credit is given to J.D. candidates for grades below 55 or to post-J.D. dates for grades below 65. No grade may be changed by an instructor has been posted in the law school or disclosed to a student unless th been an error in arithmetic certified in writing as such by the instructor

Any student who receives a grade below 55 (*F*) has the right to re course once, from the same or a different instructor, but only within academic year. (This does not apply to post-J.D. students.) The g ceived in the retaken course shall be entered into the student's re addition to the original grade, and both grades shall be included in co the student's average. A student may exercise the right to retake only with respect to two different courses during study at the Law C

The cumulative average of a student includes all grades in all course while a candidate for a particular degree.

EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

Candidates for the Degree of Juris Doctor.—A student whose cu average at the end of any semester falls below 65.0 but is above 64.0 put on probation. If such a student fails to raise the cumulative aver 65.0 at the end of the next semester, the student will not be perm register for any succeeding semester unless the student petitions for ceives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester fall 64.0 will not be permitted to register for any succeeding semester un student petitions for and receives the permission of the Scholarship Co to register.

A student who fails or receives a grade of No Credit in more th course over the entire period of law study will not be permitted to reg any succeeding semester or to graduate unless the student petitions receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing pro will be excluded as of the beginning of the semester for which the stud ineligible to register.

Students who are registered at the time they receive notice that they be permitted to register for the next semester are entitled to withdr school and to receive a full refund of the tuition paid for the semester complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the stud demonstrate that the low grades were due to circumstances beyond the control and that the student has the capacity to pursue the study of law definite likelihood of success, that student may be readmitted subject conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete

o semesters of law study before being denied permission to register for a
ceeding semester.
For this purpose the term "semester" includes a session of the summer term.
Candidates for Masters' and Doctoral Degrees.—A candidate for a master's
doctoral degree whose work is not satisfactory in the opinion of the faculty,
king into consideration the requirements and standards for the degree, may,
action of the faculty, be excluded at the end of the semester for which the
ndidate is currently registered.
A cumulative average of 78 (see page 19) is required for the Master of Laws
gree and a cumulative average of 65 (see page 24) for the Master of Com-
rative Law degrees. A student whose cumulative average falls below the re-
ired minimum at any time will be ineligible for continuation in the program
hout the permission of the Dean. Such a student will not be permitted to
ister for any succeeding semester unless the student petitions for and re-
ves the permission of the Dean or the Board for Graduate Studies.
Unclassified Students.—An unclassified student whose work is not satisfac-
y may be excluded at the end of the semester for which the student is cur-
tly registered.

MMER SCHOOL CREDIT

dents planning to attend summer school sessions at other law schools and
iring to use credits obtained at such schools in their Juris Doctor program
this Center must first have the courses they wish to take approved by the
an. Students may not take courses in summer sessions at other law schools
this vicinity if these same courses are being given during the Summer Ses-
ns at the National Law Center. In no event will credit be given for unsatis-
tory work or be recognized in excess of that which might be obtained in a
ilar period in this program. Students who register at another law school
st provide the Dean with an official transcript of their work there promptly
its completion.

ANSCRIPTS OF RECORD

ficial transcripts of student records will be issued on request of the student
former student who has a clear financial record. A fee of $2 is charged
each transcript. When more than two transcripts are ordered at the same
e, a $2 fee is charged for each of the first two transcripts and a $.50 fee
harged for each additional transcript.

NTINUOUS ENROLLMENT

gree candidates are expected to maintain continuous enrollment until *all*
ree requirements are satisfied. By failing to register for one semester or
re, the student breaks registration and must be readmitted (see "Read-
sion," page 29). A readmitted student is required to satisfy the curricu-
requirements existing at the time of readmission.

ADUATION REQUIREMENTS

plomas are awarded in February, May, and September.
To be recommended by the Faculty for graduation, a student must have met

the admission requirements of the National Law Center; completed s
torily the scholarship, curriculum, residence, and other requirements
degree for which the student is registered; and be free from all indebte
the University. Registration is required for the semester or summer se
the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" fo
be filed and the appropriate fee paid at the time of registration for
semester or summer session of the final year. Students completing deg
quirements during the Summer Sessions will be awarded diplomas (no
convocation) September 30, *provided* they have completed all degree
ments and have applied for graduation as a part of registration for the
Sessions. If they wish, such students may participate in the Winter Conv

ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and
guidelines of academic behavior. All members of the community are
to exhibit honesty and competence in their academic work. Incoming
have a special responsibility to acquaint themselves with, and mak
all proper procedures for doing research, writing papers, and taking e
tions.

Members of the community will be presumed to be familiar with th
academic procedures and held responsible for applying them. D
failure to act in accordance with such procedures will be considered
dishonesty. Acts of academic dishonesty are a legal, moral, and ins
offense against the community and will be prosecuted through the prop
versity channels.

Copies of the University policy on academic dishonesty can be
from the following offices: all department chairmen, all academic de
the Vice President for Academic Affairs.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to ins
policies governing access to and release of student education records
by educational institutions which are recipients of federal funds. The U
complies with this statute, which states, in part, that such institutions

1. afford students access to education records directly related to th
2. offer students an opportunity for a hearing to challenge such re
inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing informatio
his or her education records to persons outside the University, exc
directory information as indicated below. Information may be fu
to a student's parents without such written consent only upon cer
of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to relea
dent's record, notifying the student of this action.



The University will release the following directory information upon request: ne, local address, and telephone number; name and address of next of kin; es of attendance; school, college, or division of enrollment; field of study; dit hours earned; degrees earned; honors received; participation in organ- ions and activities chartered or otherwise established by the University cluding intercollegiate athletics); and height and weight of members of ath- teams. A student who does not wish such directory information released t file written notice to this effect in the Office of the Registrar.

opies of the University's full policy statement on the release of student rmation may be obtained from the Office of the Registrar.

HT TO CHANGE RULES

University and its various colleges, schools, and divisions reserve the right odify or change requirements, rules, and fees. Such regulations shall go force whenever the proper authorities may determine.

HT TO DISMISS STUDENTS

student knowingly makes a false statement or conceals material information n application for admission, registration card, or any other University doc- t, the student's registration may be canceled and the student will be in- le (except by special action of the Faculty) for subsequent registration. e right is reserved by the University to dismiss or exclude any student the University or from any class or classes, whenever, in the interest of tudent or the University, the University Administration deems it advisable.

HT TO MAKE CHANGES IN PROGRAMS

right is reserved by the University to make changes in programs without e whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A and Found" Office is maintained on campus in the Safety and Securit

STUDENT CONDUCT

All students upon enrolling and while attending The George Washing versity are subject to the provisions of the *Statement of Student Ri Responsibilities* which outlines student freedoms and responsibilities of the Judicial System for Non-Academic Student Discipline, and other and regulations as adopted and promulgated by appropriate University ties. Copies of these documents may be obtained at the Office of the V dent for Student Affairs. Sanctions for violation of these regulations clude permanent expulsion from the University, which may make enro another college or university difficult. Regulations or requirements only to a particular program, facility, or class of students may not be generally, but such regulations or requirements shall be published in reasonably calculated to inform affected students.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation laws which proscribe possession, use, sale, or distribution of drugs. Me the academic community should know that administrative action, wh include dismissal from the residence halls, revocation of other privileges pension or dismissal from the University, may be taken in order to pro interests of the University and the rights of others.

Center for Academic and Administrative Computing

Director F. William Rambo

The Center for Academic and Administrative Computing is located third floor of Lisner Hall, 2023 G St., N.W. The computer and other tional supportive services are located on the first floor of Stuart Hall St., N.W. These facilities normally are available 24 hours a day, seve week to all faculty, staff, and students.

The Center provides computational facilities, conducts seminars, with users, and provides operational assistance as required. The Cen ates an IBM 3031 (OS/VSI) central processing unit and a PDP computer which provides terminal and card remote-job-entry (RJE 3031 for students. There is a full range of compilers and applica ware packages.

Computer programming courses are offered by the School of Gov and Business Administration, the Department of Statistics, and the Sch Engineering and Applied Science. In addition, many other departme courses that utilize the computer as a research adjunct to course work.

ESIDENCE HALLS

he University does not provide regular residence hall space for graduate stu-nts. However, the Housing Office refers graduate students to apartments as ey become available in three University-owned buildings which are in the mpus area. Additionally, the Housing Office operates an Off-Campus Housing esource Center, and attempts to provide information and assistance for those eking accommodations. For complete information on this service, as well as partment guides and referrals, interested applicants should contact Director Housing, George Washington University, Washington, D.C. 20052.

OOD SERVICE

ntract food service is available from August to May, and is based on the dergraduate academic calendar of registration, exams, and vacation periods. commodations for the law school calendar are made. The rate for the seven-, 19 meals per week plan has been set at $1,260. The any 14 meals per week n costs $1,190; the any 10 meals per week plan, $1,140. Contract service is feteria style and provided in two residence halls and the Cloyd Heck Marvin nter. Meal coupons may also be used on a cash equivalency basis in the arvin Center first floor a la carte cafeteria and in the Rathskeller.

OYD HECK MARVIN CENTER

e Cloyd Heck Marvin Center serves as the campus community center, pro-ing services, conveniences, and recreational and social opportunities for dents, faculty, staff, alumni, and guests. Its wide range of facilities pro-es the setting for a variety of programs conducted by the University Pro-n Board, the departments offering course work in the performing arts, and er student and faculty organizations.

he Center Governing Board, representing varied segments of the University mmunity, plays an important role in the day-to-day functioning of the Cen-This Board works closely with the full-time staff in the development of cedures and policies which provide a framework for the Center's operation.

UDENT HEALTH SERVICE

Student Health Service is an outpatient clinic located in the H.B. Burns morial Building at 935 22nd St., N.W.

hysicians and physician assistants are available by appointment from 9 a.m. 45 p.m., Monday through Friday. In addition, physician assistants are avail-for primary care to walk-in patients Monday through Friday from 5 to p.m., on Saturday from 9 a.m. to noon, and on Sunday from 10 a.m. to n.

r serious emergencies occurring during hours when the Student Health ice is closed, students may go to the Emergency Room of the University ital for treatment. This arrangement is for emergency care only, and all are the responsibility of the student.

Students must be currently enrolled on campus in the University to treatment at the Student Health Service. Students who so desire may physicians and nurses of their own choice, but these students will be res for all fees charged. The bills incurred from all services rendered outsi Student Health Service (for example, x-ray work, laboratory work, and to specialists or other outside physicians) are the responsibility of the

Health and Accident Insurance

The Student Health Service Office has arranged for and endorsed grou and accident insurance, on an elective basis, for those *full-time* stude do not have other coverage. Interested students should contact the Health Service Office.

STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside ment to less than 16 hours (see "Academic Work Load," pages 37–3 urged that full-time students refrain from engaging in outside emp during their first year. Although work in some special areas may co to the learning and experience of the student, as a general rule it will with time needed for adequate study and preparation, which are at the a good legal education.

PLACEMENT SERVICE

The Law Center takes a continuing interest in the placement of its and alumni. The Dean, the Faculty, and the Placement Office coop providing information from alumni, law firms, government agencies, sources concerning job openings for our seniors and alumni throug country. Other services include part-time and full-time law clerk listing mer positions, programs on job-seeking skills, a library of available lit on law placement, counseling on various opportunities, resume prep guidance, arrangement of on-campus interviewing programs, and the tration of the judicial clerkship evaluation program.

Of the 1979 graduates, 318 graduates informed the Placement Office positions. There was considerable variety in the types of positions obtain 130 in private law firms, 73 with the federal government, 25 with st local government agencies, 21 with business concerns, 31 as judicial eight with legal services for the indigent, eight with public interest o tions, one with a public defender's office, seven with accounting firm in military positions, five with academic communities, and seven with associations. These positions were located in 28 states and the Dis Columbia.

VETERANS BENEFITS

The veterans counselor, located on the fifth floor of Rice Hall, 2121 Eye N.W., assists students entitled to educational benefits as veterans or as or children of deceased or totally disabled veterans with any problems may arise concerning their benefits. This Office also processes certific

rollment and attendance to the Veterans Administration so that monthly al-
vances will be paid.
When feasible, students entitled to benefits as veterans or dependents of
erans should consult with the veterans counselor prior to submitting ap-
cation to the Veterans Administration. All such students should obtain the
truction sheet issued by the Office of the Registrar, which sets forth require-
nts to be fulfilled before certification of enrollment can be made to the
terans Administration, and which includes other information of general
erest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington,
C. 20421.

FICE OF SERVICES FOR STUDINTS WITH DISABILITIES

e Director of the Office of Services for Students with Disabilities co-
inates advising, orientation, and special services which address the needs of
abled students. The Director also serves as a central point of contact from
ich the University community may obtain information and assistance in
ving disabled students. A resource library maintained in the Services Office is
ilable for general use.

n addition to coordinating a program of general assistance to promote
gration of disabled students as fully as possible into the life of the University
mmunity, the Director administers reading and sign language services for
se with visual and auditory handicaps.

The Office of Services for Students with Disabilities is located on the fourth
r of Rice Hall, 2121 Eye Street, N.W.

COURSES OF INSTRUCTION

The courses of instruction listed below are subject to change. The Un
reserves the right to withdraw any course announced.

The number of hours of credit given for the satisfactory completi
course is indicated in parentheses after the name of the course. Thus
course giving two hours of credit each semester is marked (2–2), and a
ter course giving two hours of credit is marked (2).

In most courses, a final examination is held during the examination
and the grade in the course is determined in large part by that exam
These courses are parenthetically marked "Examination."

Courses that require the preparation of a major research paper in lieu
examination are parenthetically marked "Research Paper." The satis
completion of such a paper by a student individually will satisfy the
Writing curriculum requirement for the J.D. degree.

Courses parenthetically marked "Problem Assignments," "Writing
ments," "Take-home Examination," "Choice of Paper or Examinatio
"Clinical Work" indicate the nature of the method planned by the
for determining in major part the grade to be given for the course. A
marked with any of these designations will not satisfy the Legal Writing
ulum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morn
afternoon. Evening classes begin at 5:50 p.m. Many examinations
day and evening classes may be given in the afternoon only. Examinati
day students may be held in the evening.

A parenthetical designation at the end of a course description
whether the course is scheduled to be offered in the spring or fall semes
in the summer sessions, and also usually whether it will meet in the
evening. When a double-numbered course is designated "Academic ye
first half of the course is scheduled to be offered in the fall, the secon
in the spring. Courses with no parenthetical designation indicating
offering are not scheduled to be given during the 1980 summer session
1980–81 academic year.

Courses for Juris Doctor Candidates

Required courses are numbered from 201 to 300. Courses numbered fro
to 400 are normally taken by second- and third-year students. Courses
bered from 401 to 600 are generally more advanced. Second-year
may take courses numbered above 400 only with the permission of the
Third-year students are encouraged to take one course numbered abo
each semester, and may take more than one such course with the per
of the Dean.

The following courses are among those offering clinical work: Law
346, 396, 398, 399, 459, 513, 516, 579, 596.

EQUIRED COURSES

203–4 Contracts I–II (4–2) Nash, Cibinic, Pock, Caplan

Legal remedies of contracting parties, including damages in contract and quasi-contract, specific performance, reformation, rescission, remedies in tort; acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof; function of consideration; conditions; assignments; third-party beneficiaries; effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

207 Torts (4) Seidelson, Banzhaf, Schwartz, Sirulnik, Reitze, Dienes

Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses; causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. (Examination) (Fall—day and evening)

211 Property (4) Starrs, Schiller, Brown, Chandler

Basic concepts of personal property. Real property: historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interests at common law and after the Statute of Uses; introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Fall—evening; spring—day; summer 1980)

212 Constitutional Law (4) Mayo, Barron, Park, Cheh, Dienes

Basic principles of American constitutionalism; judicial function in constitutional cases; implementation of doctrines of separation of powers, federalism, limited government; development and exercise of national powers; introduction to civil rights and liberties. (Examination) (Spring—day and evening: summer 1980)

215 Criminal Law and Procedure (4) Starrs, Robinson, Zenoff, Sirulnik, Caplan

Purposes of criminal law, elements of criminal liability, selective consideration of specific crimes, introduction to criminal procedure. (Examination) (Fall—day; spring—evening)

218 Civil Procedure (4) Sharpe, Schwartz, Kayton, Stevenson, Cheh, Raven-Hansen, Francis, Guido

Mechanics of litigation—rules which govern the process by which rights and duties studied in substantive law courses are enforced; pleadings, discovery, pre- and post-trial motions, jurisdiction and venue, equity jurisdiction and trial by jury, former adjudication. Emphasis on Federal Rules of Civil Procedure, but principles and main problems indigenous to all procedural systems are developed. (Examination) (Spring—day and evening)

220 Legal Research, Writing, and Professional Responsibility and Ethics (2) Seidelson and Staff

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and

appellate court brief; instruction and experience in the prepara
argument of an appellate court case; instruction in questions of
sional responsibility and ethics. The grade *CR* (Credit) or
Credit) is given for this course. For credit, a student must attain
mum grade of 65. Failure to complete the work in this course w
in a grade of 45. (Fall—day and evening)

232 **Evidence** (4) Seidelson, Robinson, Albert, Park, Sc

Preparation and presentation of evidence, including proof of
qualification and examination of witnesses with emphasis on impea
privilege; opinion testimony; determination of relevancy; demon
experimental, scientific evidence; application of the hearsay rule.
nation) (Spring—day and evening)

ELECTIVE COURSES

302 **Admiralty** (3)

American practice and jurisdiction in admiralty; saving clause
law. Substantive maritime law of title and possession, maritime
personal injury and wrongful death, charter parties and bills of
general average and salvage and marine insurance, collisions. Law
methods: judge-made law, statutes, international commercial custo
treaties. (Examination) (Spring—day)

303 **International Law and World Order** (3)

An introduction to international law which provides the back
for the study of specialized seminars; emphasis on national s
participants in decision-making processes with consideration of
bodies and other participants; analysis of range of available
roles and effects of international agreements under United Sta
stitution; introductory study of the World Bank. Complements
not repeat material in Law 304. (Examination) (Fall—day and e
summer 1980)

304 **United Nations Law and World Order** (2)

Introduction to international law through study of law and pro
United Nations Charter; structure and process of decision of Un
tions; maintenance of international peace and security—peaceful
ment of disputes and national and collective self-defense; includ
rent problems considered by the General Assembly and Security
and recent decisions of the International Court of Justice. Comp
but does not repeat the material in Law 303. (Examination)
day and evening)

307 **Comparative Law** (3)

Introduction to comparative method and analysis, basic features
law systems, sources, legal profession, judicial organization, cons
issues. The course includes material dealing with selected issues
temporary and practical interest in such fields as domestic re
heritance, contracts, torts, consumer protection. Emphasis on the
relationship between comparative law and conflict of laws, and de
of methods of conflict avoidance and problems attendant upon
tional litigation. (Examination) (Spring—day)

309 Conflicts of Laws (3) — **Seidelson, Pock, Lowther**

Legal problems arising from occurrences transcending state or national boundaries; jurisdiction; foreign judgments; constitutional influences; theoretical bases of choice of law principles and their application to specific fields, including torts, contracts, property, family law, administration of estates, business associations. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Lowther—(Problem Assignments); Seidelson, Pock—(Examination) (Fall—evening; spring—day; summer 1980)

311 Agency and Partnerships (2) — **Sharpe, Schiller**

Employment relations, vicarious liability of employers for employees' torts, scope of employment, and independent contractors; agents' authority and apparent authority to contract for their principals, ratification; nonprofit associations; the formation, operation, and termination of partnerships; limited partnerships. (Examination) (Fall—day and evening; summer 1980)

312 Corporations (4) — **Stevenson, Solomon, Park, Cheh**

Corporate law, with emphasis on operations and financing of corporations. Control of corporations, action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty, insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening)

313 Sales and Sales Financing (2) — **Albert, Rothschild**

Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening)

314 Commercial Paper, Check Collection, and Banking (2) — **Albert, Rothschild**

Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection: the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Spring—day and evening)

318 Creditors' Rights (3) — **Cheh**

Creditors' remedies outside bankruptcy—compositions, agreements, general assignments; bankruptcy proceedings under the federal statute, administration, discharge, the position and powers of the trustee, preferences; corporate reorganization under Chapter X of the Bankruptcy Act. (Examination) (Fall—day; spring—evening)

321-22 Current Decisions (2–2)

Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Academic year—day and evening)

323 Journal of International Law (1 to 4)

Limited to editors of the student staff of the *Journal of Internation*
and Economics. The grade *CR* (Credit) or *NC* (No Credit) is g
this course. (Fall and spring—as arranged)

325–26 Trusts and Estates I–II (3–3) Weaver, Chandler, Sm

Noncommercial transfers of wealth at death or during life. La
essential elements and formalities for creation of trusts and execu
wills, revocation and alteration, grounds for contest, limits on p
owner's power to control, intestate succession. Law 326: C
provisions, common questions of construction, future interests p
administration of estates and trusts, charitable trusts. Prerequisite
325: Law 211; to Law 326: Law 325. (Examination and Proble
signments) (Law 325: fall—day and evening; spring—day; La
spring—day and evening)

327 Modern Real Estate Transactions (2) Brown, S

Advanced problems in purchase and sale of real estate: legal respo
and functions of buyer, seller, broker, escrow agent, conveyancer
ney, title examiner, abstractor, insuror of title; process of examinat
assurance of title and other interests in realty, including recordi
tration and title insurance systems, settlements and closings, wa
hazard insurance; emerging problems related to cooperatives, co
iums and property-owners' associations; problems related to co
with subdivision, zoning, building and housing code regulations
nation) (Spring—day)

329 Unfair Trade Practices (3) Weston, Banzhaf, Schwartz, S

Unfair trade practices at common law and under statutes; tra
trade names; copyright law; misappropriation of ideas; protection
petitors and consumers against false advertising under Federa
Commission Act; resale price maintenance under state Fair Trad
state sales-below-cost statutes; Robinson-Patman Price Discrimina
miscellaneous business practices. (Examination) (Fall—da
evening)

330 Federal Antitrust Laws (3) Weston, Sch

Sherman and Clayton Acts, related statutes. Price-fixing agreeme
other types of trade restraints considered under Section 1; monop
considered under Section 2 of the Sherman Act. Mergers and tie-
other activities under the Clayton Act. All types of business
raising questions under the antitrust laws, including trade asso
tivities, exclusive-dealing arrangements, boycotts, patents and co
(Examination) (Fall—day; spring—evening)

331 Product Liability (2)

Development of the concept of product liability and consumer's
Specific problems and processes in evaluation of risk and ha
countered in government regulation of dangerous and defective
Survey of civil actions for harm resulting from defective and
products with reference to parties and proof in negligence, war
sance, fraud, misrepresentation, and other cases. Problems asso
hazard identification, insurance, and industry self-regulation. R
Consumer Product Safety Act and current legislation dealing
juries and remedies in specific areas. (Choice of Research P
Examination) (Spring—day)

332 **Federal Jurisdiction** (2) Albert, Lowther, Barron, Kayton, Francis

Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions (including problems of advisory opinions, standing to litigate, justiciability), federal questions in federal courts, federal review of state court decisions (including relation between state and federal substantive law, procedural problems in exercising review, application of law to fact). The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Albert—(Examination); Lowther—(Problem Assignments) (Fall—day and evening; spring—day)

334 **Advanced Criminal Procedure** (2) Starrs, Robinson, Zenoff

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Starrs—(Examination and Problem Assignments); Robinson, Zenoff—(Examination) (Fall—day and evening)

335 **Jurisprudence** (2) Mayo, Park, Albert

Basic jurisprudential concepts; nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic; law and justice; the judicial process; legislative, executive, administrative decision-making; impact of politics, economics, and scientific advance on legal systems; contemporary trends in jurisprudential thought. (Examination) (Fall—evening; spring—day; summer 1980)

336 **Taxation—Federal Income** (3) Weaver, Hambrick, Solomon, Kempler

Survey of substantive provisions of federal income tax law, including concept of gross income, provisions affecting taxation of family and individual transactions, limitations on allowable deductions, sales and dispositions of property, problems of capital gains taxation, nontaxable exchanges. Weaver—(Examination and Problem Assignments); Hambrick—(Examination) (Fall—day; spring—day and evening; summer 1980)

338 **Taxation—Federal Estate and Gift** (3) Hambrick, Weaver

(Formerly 2 credits)

Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction and split gifts; tax procedure. (Examination) (Fall—day; spring—evening)

339 **Collective Bargaining and Labor Arbitration** (3) Merrifield, Rothschild, Seibel

Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 341. Merrifield—(Examination and Problem Assignments); Rothschild — (Problem Assignments) (Spring — day and evening)

340 **Taxation—Federal Income, Corporations and Shareholders** (3) Hambrick, Solomon, Kempler

Continuation of Law 336. Primary emphasis on corporate-shareholder relationships. Problems of corporate dividends, redemptions of stock,

distributions in partial and complete liquidation, stock dividends, b
and dividends in kind closely analyzed. Federal income tax
involved in the formation of corporations, the sale of corporate
(including collapsible corporations), mergers and acquisitions, an
rate divisions. Students who have received credit for former L
cannot receive credit for Law 340. Prerequisite: Law 336. (E
tion) (Fall—evening; spring—day)

341 **Labor Law** (3) Merrifield, Albert, Ru

Law governing labor-management relations, organizations and
tation of employees, regulation of economic weapons, enforce
collective bargaining agreements, interunion and intra-union
(Examination) (Fall—day and evening)

342 **Moot Court** (1 or 2)

Satisfactory participation in the upperclass competition results
hour of academic credit. Finalists in the upperclass competitio
two hours of academic credit. Finalists in the first-year comp
receive one hour of academic credit. No academic credit is awa
nonfinalists in the first-year competition. The grade *CR* (Credit)
(No Credit) is given for this course. (Fall and spring)

343 **Law Students Civil Rights Research Council (LSCRRC)** (2, 3, or 4) Sirulnik a

Clinical problems concerned with the legal problems of
women, and the poor. Students work with organizations such
Lawyers Committee for Civil Rights Under Law, Women's Legal D
Fund, Civil Rights Division of the Justice Department, Institute
Development of Indian Law, National Committee Against Discr
in Housing, and National Senior Citizens Law Center. Appro
60 hours of work per semester is required for each credit ho
grade *CR* (Credit) or *NC* (No Credit) is given for this course. Per
of the instructor is required prior to registration. (Fall, spring, s

344 **Legal Writing** (1 or 2)

Preparation of a research paper under the supervision of a full-time
ber of the Faculty who will determine, prior to registration, whet
work required for the topic selected justifies one or two semester ho
credit. If elected for one hour of credit, this course may be requ
meet the legal writing requirement for the degree. Approval of
ulty member is required prior to registration. (Research Paper
(Fall and spring—as arranged; summer 1980)

345 **Law Students in Court** (4) Sir

Open to third-year law students who have completed 51 credit ho
the time the course commences, including Law 215, 218, and 232. St
represent indigent litigants in the Small Claims, Landlord-Tenant
Criminal (misdemeanors) division of the D.C. Superior Court. A
clude client interviews, investigation, settlement negotiations, pre
and argument of motions, and conduct of trials. Students are req
spend one day in court and attend seminars each week. Some se
are held off campus. Application must be made during the spring se
of the preceding academic year. Students are selected on the basis o

academic record and interest in litigation and working with indigent clients as demonstrated by elective courses, other clinical work, extracurricular activities, and employment experience. A commitment of two semesters (one of which may be summer) is required. This course may not be taken at the same time as Law 579, or any litigating activities in Law 346. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged; summer 1980)

346 **Legal Aid** (arr.) Sirulnik and Staff

(1) *Civil Administrative Law Clinic*—Working under the supervision of staff attorneys, students represent indigent litigants before state and federal administrative agencies. Activities include Social Security Disability hearings, Rental Accommodations Office hearings, Unemployment and Workman's Compensation hearings, Food Stamp reviews, will writing, and other public benefits program work. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration.

(2) *Immigration Clinic*—Clinical work includes representation of clients at deportation hearings, and oral argument before the Immigration and Naturalization Service, Board of Immigration Appeals, and the U.S. Court of Appeals. Students will assist aliens residing in the Washington area with a wide variety of problems, including adjustment from nonimmigrant to immigrant status, obtaining labor certifications and work visas, obtaining visas for their relatives in other countries to enter the United States, and obtaining voluntary departure orders for those whose visas have expired and who are threatened with deportation. Ten hours work per week required. Two-hour weekly seminar and additional weekly meeting with supervisor. Permission of the instructor required prior to registration. Successful completion of Law 586 suggested but not mandatory.

(3) *Outside Clinical Placement*—Students arrange independent projects with state or federal public interest organizations for academic credit. A compilation of suggested projects available within the Community Legal Clinics office. Projects must receive prior approval by the Director of Clinical Programs or the staff.

(4) *Small Business Clinic*—Under guidance of the instructor, students assist small businesses and non-profit organizations, dealing with a wide variety of problems, including drafting partnership and incorporation papers, drafting and reviewing contracts and commercial leases, advising on tax problems, and resolving disputes. Prerequisite: Law 312 and 336. Permission of the instructor required prior to registration.

The grade *CR* (Credit) or *NC* (No Credit) is given for all sections of this course. (Fall, spring, summer))

347 **Insurance** (2) Schiller, Pock

A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Includes insurance marketing, insurable interest, subrogation, transfer of insurance benefits to nonpolicyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—day and evening; summer 1980)

348 **Domestic Relations** (2) Potts, Zenoff

Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Fall—day and evening)

351 Law and Accounting (2) Cibinic, Kempler,

Study of fundamental accounting principles with emphasis on corp
accounting; legal and accounting implications of specific items in
statements of corporations; inventory adjustments; corporate tran
distributions, capital adjustments. Strongly recommended for stude
have had no accounting. (Examination and Problem Assignment
(Fall—evening; spring—day and evening)

355 Government Contracts (3) Nash,

Survey of basic law underlying government procurement, basic pow
limitations on federal government in entering into contracts,
trative and legislative policies governing these contracts, advertis
negotiated procurement procedures, forms of contracts and clause
Law 431 *Government Procurement Law* is the substantial equival
this course. (Examination and Problem Assignments) (Spring

359 Patent Law (2)
(Formerly 3 credits)

Law of patents subsequent to issuance of patent; nature of patent as
erty and as a legal instrument; validity—novelty, nonobviousness
mercial success; infringement—direct and contributory, doctrine of
lents and file-wrapper estoppel. Substantive concepts introduced
order approximating patentee's and infringer's cases in litigation. D
for students intending to specialize in patent law; knowledge or exp
in patent law helpful but not prerequisite. (Examination)
evening)

362 Patent Office Practice (2) Kayton,

Substantive and procedural law of patents leading to issuance of
mainly related to proceedings before U.S. Patent Office. Obtain
preserving earliest possible patent filing date; continuing applicatio
judicata, novelty and nonobviousness requirements; substantive re
priority of invention and related affidavit practice; nature of claim
formal defects; restriction and double patenting. Designed for s
intending to specialize in patent law. Prerequisite: Law 359. (Exa
tion) (Fall and spring—evening)

372 Administrative Law (3) Park, Banzhaf, P
Schwartz, Raven-H

Study of the administrative process in executive and independent
tory agencies; emphasis on judicial review. Formal and informal
making, investigation, planning, and public administration func
the agencies as related to their legal limits and to the roles of
government and private practice. Relationships of agencies to the
tive and legislative branches, to public and private interest groups,
the social, political, and economic aspects of various philosop
government regulation. Park and Banzhaf—(Examination)
day; spring—evening)

375 Remedies (3) Cibinic, Nash, L

Development and use of judicial remedies that give relief for
threatened injuries to interests of personalty and property. Remed
proaches include compensatory and punitive damages, injunctions,

enrichment, constructive trusts, equitable liens, tracing, subrogation, and specific reparation. Emphasis on comparing remedial options in fraud, mistake, duress, breach of contract, and abuse of fiduciary relationships. The grade *CR* (Credit) or *NC* (No Credit) only is given in sections taught by Lowther. Cibinic—(Examination); Lowther, Nash—(Problem Assignments) (Spring—day and evening; summer 1980)

377 **Legislation** (2) Zenoff

Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination)

385 **Trial Practice Court** (2) Pryor, Ryan, Kendrick, McMullin, Skinker, Stevas, Altshuler, Nunzio, Seidel

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite: forty-two semester hours, including Law 218. Prerequisite or concurrent registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day and evening)

389 **Medicine for Lawyers** (2) Hirsh

Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation as well as in commitment and equitable proceedings. Students may witness autopsies at the D.C. Medical Examiner's Office, surgery at George Washington University Hospital, and medical rounds at D.C. General Hospital. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. (Examination) (Fall and spring—day)

390 **Law and Medicine** (2) Sharpe, Fiscina

Malpractice, insurance, and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions; professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. (Examination) (Fall—day and evening)

391 **Federal Indian Law** (2) Dean

Survey of the federal laws, regulations, and policies applicable to American Indians because of their status as Indians, including a review of the development of the fundamental legal doctrines (tribal sovereignty, federal supremacy in Indian affairs, the guardian-ward relationship, the trust responsibility) and the current legal status of tribal governments in the federal system. Special emphasis on current trends and conflicts in federal Indian legislation and policy, such as the implementation of the Indian Self-Determination and Education Assistance Act and the Alaska Native Claims Settlement Act, congressional programs of economic assistance to Indian tribes, tribal-state jurisdictional conflicts, and questions involving the protection and development of Indian resources. (Examination) (Fall—evening)

394 **Women and the Law** (2)

An examination of the treatment of women in all areas of the of legal remedies for sex discrimination. Emphasis on constituti criminal law, discrimination in the media, education, and emp Students choose clinical projects or research papers on which to semester's work. Enrollment limited to 30 students. (Research Pa (Spring—day)

396 **Legal Activism** (2 or 3)

Study of the legal process, not to benefit individual clients, but as ful tool for affecting social change and advancing the public Topics discussed in a 2-hour seminar meeting each week include of maximizing legal leverage, legal judo, guerrilla law, working press and Members of Congress, drafting of legal documents, legal tools and tactics, negotiation, making money from public law, etc. Students may choose to bring a public interest legal actio an agency and/or in court, or undertake another legal action pro 3 credits and receive a numerical grade. Alternatively, students research on a topic related to public interest law for 2 crdits on a basis. (Fall—day)



398 **National Center for Law and the Deaf Clinical Education Activities** (1, 2, or 3) — Banzhaf

Work with the National Center for Law and the Deaf in bringing legal information, services, and representation to the more than 13 million Americans who are deaf or hearing-impaired. The Center is designed to help make the hearing-impaired aware of their legal rights and to assist them in solving their legal and law-related problems. Students may participate in one or more projects: (1) counseling persons with hearing impairments about legal problems at a walk-in clinic usually held on the Gallaudet College campus; (2) preparing and participating in workshops for hearing-impaired persons to acquaint them with their rights and obligations under the law; (3) assisting in representing the interests of deaf and hearing-impaired persons in judicial and administrative proceedings; (4) preparing research papers on topics related to law and the deaf, or preparing handbooks explaining legal topics to the hearing impaired. Students may learn some sign language, but will be assisted by trained translators when dealing with deaf individuals. Approximately 60 hours of work per semester is required for each credit hour. Students may repeat this course for a maximum of eight semester hours of credit. This course may not be taken at the same time as Law 345, or any litigating activities in Law 346. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

399 **Clinical Law Work** (arr.) — Staff

Projects involving litigation, research, or public interest activities of a legal nature (including aid to indigents, support of public interest nonprofit corporations, and support of governmental agencies or courts) may be initiated and will be supervised by a faculty member. Projects must be approved in advance by the Law Center Supervisory Committee (three members) both as to whether the project is appropriate and as to the number of semester hours of credit to be granted. A maximum of 10 semester hours of credit may be taken in one or two semesters. This course is open to a limited number of third-year law students. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring)

LINICAL LEGAL STUDIES

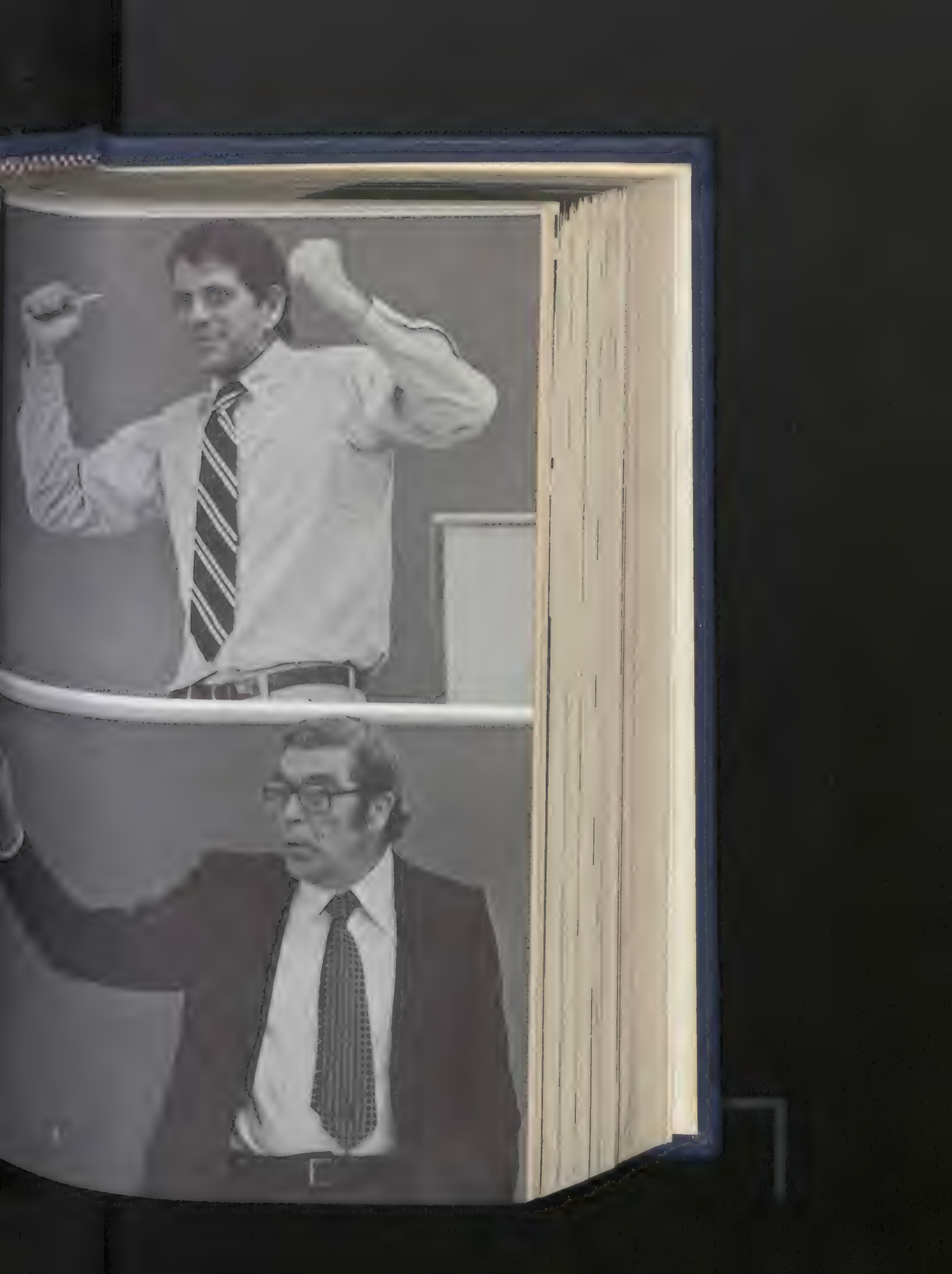
irector: E.S. Sirulnik

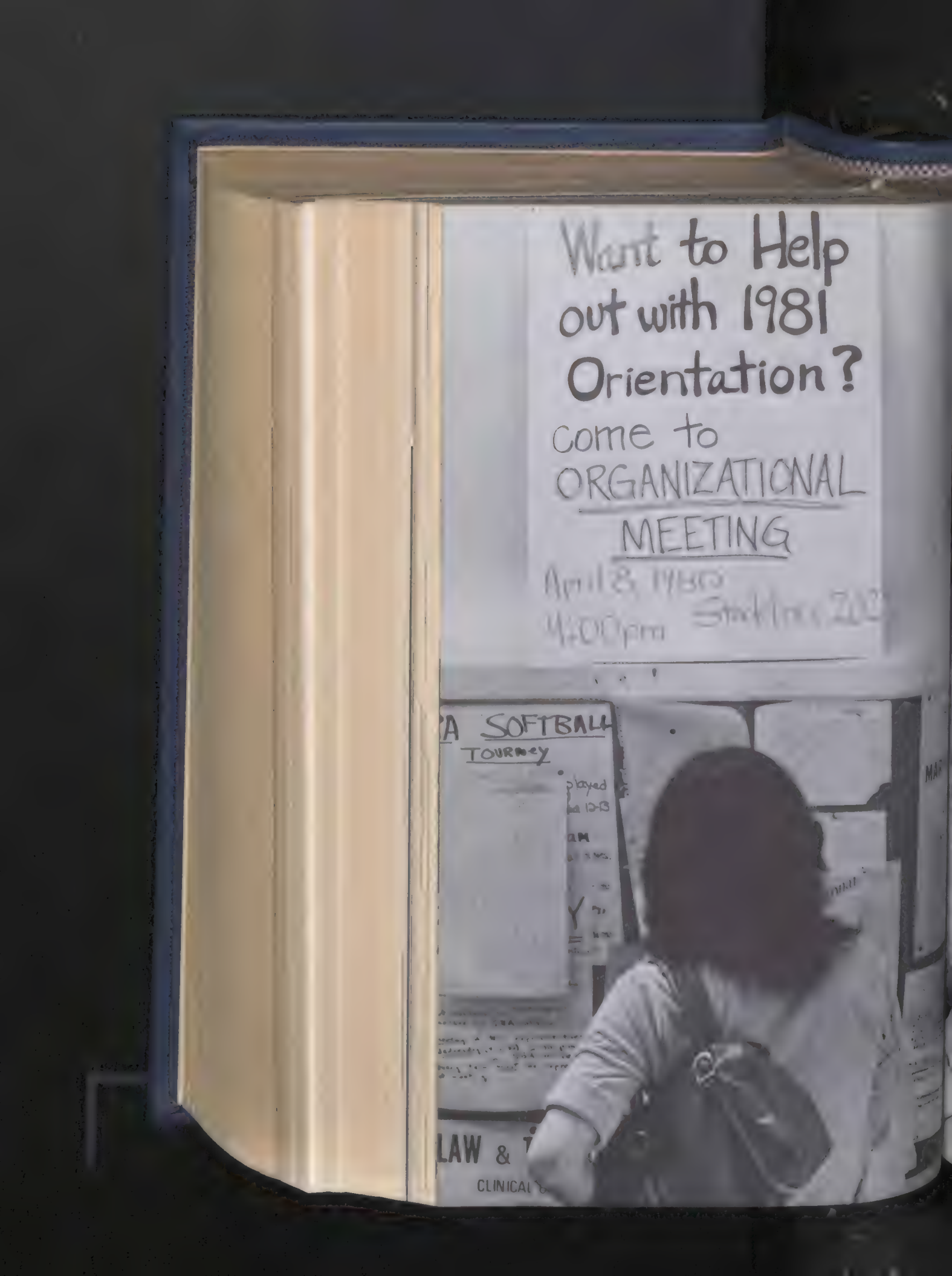
aculty Advisors: D.P. Rothschild, E.S. Sirulnik, R.B. Stevenson, J. Banzhaf III, A.W. Reitze

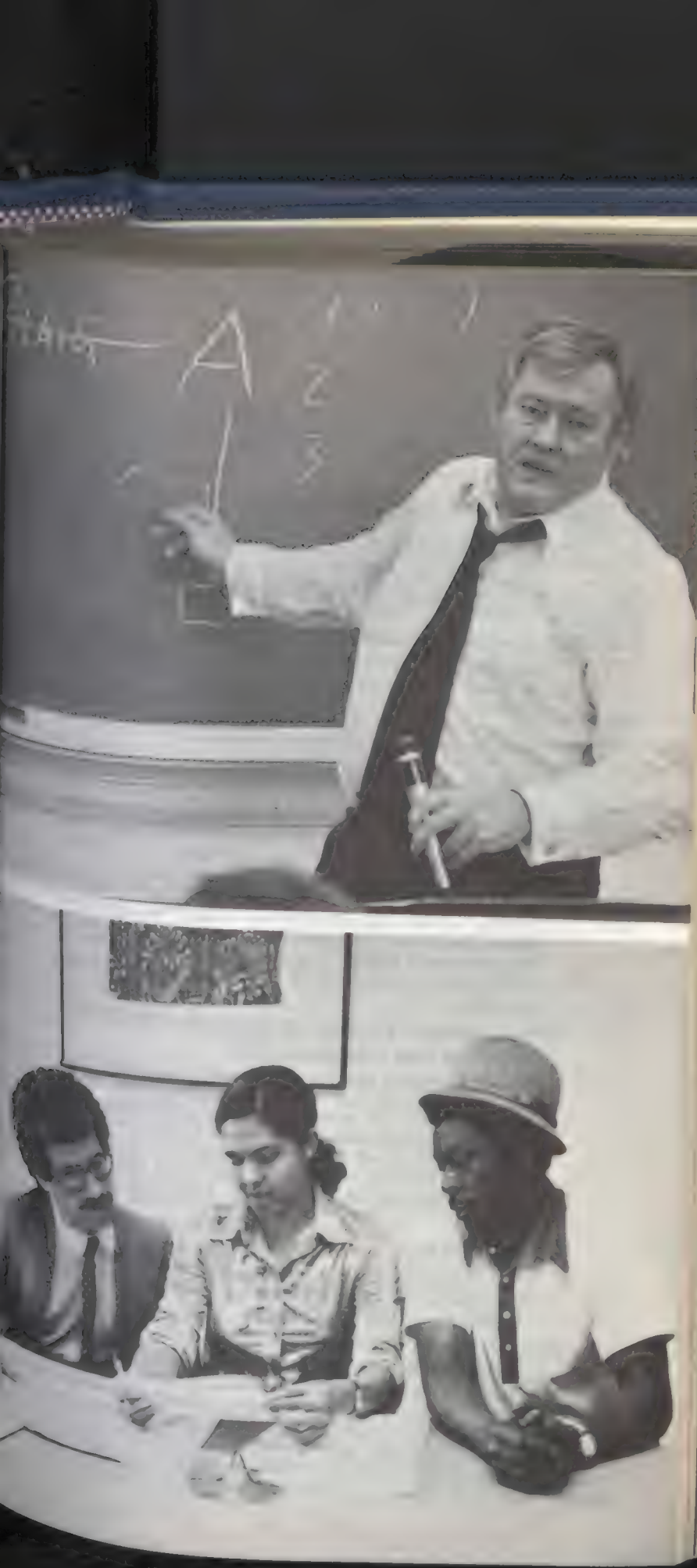
lated Courses

343 *Law Students Civil Rights Research Council (LSCRRC)*
345 *Law Students in Court*
346 *Legal Aid*
396 *Legal Activism*
398 *National Center for Law and the Deaf*
399 *Clinical Law Work*
459 *Problems of the Consumer*
513 *Environmental Litigation*
516 *Clinical Studies in Environmental Law*
579 *Clinical Studies in Urban Law*
596 *Graduate Clinical Studies*

COZSCOZE




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MEETING
SOFTBALL
TOURNEY
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LAW &
CLINICAL



Advanced Courses

ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers: R.E. Park, G.E. Weston

403 **Public Economic Policy and the Law** (2)
Interrelation of law and economics in such subject-matter categ
decisional contexts as economic regulation of industry, fiscal po
ning, government research and development practices, foreign
investment, and public spending priorities. (Research Paper)
—evening)

404 **Securities Regulation** (2) Stevenson, L. Cohen, Black
State and federal laws governing offering and distribution of sec
the public by corporate issuers and others, regulation of securities
rights and liabilities of purchasers under such statutes. Emphas
utes administered by Securities and Exchange Commission. (Ta
Examination) (Fall—evening; spring—day)

405 **Regulation of Securities Markets** (2)
Operation of over-the-counter and exchange markets, including
tive and monopolistic practices in each market; relationship of
laws and securities regulations to concept of a free and open marke
role of regional exchanges and third market in providing
element in market; advantages and disadvantages of a fragmented
minimum fee structure; rebates and their effect on merchandising
curities and financial soundness of industry; use and availability
nomic data in evaluating performance of market place. The se
examine matters directly of interest to graduate law students, law
omists, and political scientists. (Take-home Examination)
evening)

411 **Administrative Practices and Procedures (Food and Drug Administration)** (2) Rothschild,
The study of FDA administrative procedures for the purpose of
ing the significance that administrative practice has on regulato
ity. The course will consider FDA rulemaking procedures in
step-by-step consideration of the various hearing procedures now
under the new agency practices and procedures, and problems
enable the practical application of rulemaking and hearing pro
achieve resolution. Prequisite: Law 372. (Research Paper)
evening)

412 **Food and Drug Law** (2) Kaplan
The Federal Food, Drug, and Cosmetic Act, and related laws. Co
government, and industry viewpoints. (Choice of Research Paper
amination) (Spring—evening)

413 **Public Policy and Mass Media** (2) Barron
Institutional structure of mass media and their interrelationships;
logical aspects of mass communications; continuing adjustments
public interest goals, the economic system, and technological
ments; influence of and controls exercised by government, other
tions, and private groups; conflict between freedom of speech
media and other major community interests; the media's relations

the interests of dissident and minority groups and the access of these groups to the media. Barron—(Examination or Research Paper); Secrest—(Research Paper) (Fall—day; spring—evening)

414 **Regulated Industries** (2) Park, Schechter

Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper) (Spring—day)

415 **Economic Theory for Lawyers** (2) Raven-Hansen

For students with no prior economics training. No calculus or statistics is required. Key principles of economic theory are presented, with focus on the application of these principles to antitrust, regulatory impact analysis (including environmental cost/benefit analysis), utility ratemaking and regulation, and deregulation. The course also considers preparation and examination of economic expert witnesses in these areas of the law. (Examination) (Spring—evening)

417 **Seminar: Trade Regulation** (2) Weston, Bodner

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper) (Spring—evening)

aster of Laws candidates in the area of Administrative Law: Economic Regu-ation who have not taken the following courses or their equivalent as part of Juris Doctor or Bachelor of Laws program should include them in their Mas-r's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
372 *Administrative Law*

her Related Courses

494 *Use and Control of Nuclear Energy*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
571 *Land Development Planning*

RPORATION LAW

ulty Advisers: R.B. Stevenson, Jr., L.D. Solomon

424 **Business Planning** (2) Stevenson, Flyer, Lewis, Berkeley, Press

Integrated study of corporate, financial, tax, accounting, and SEC aspects of the following: organization of a small corporation; organization of a public corporation; stock dividends, recapitalization, and stock repurchases in the context of conflict between active stockholders of a closed corpora-

tion and the family of a deceased active stockholder; corporat
tions; corporate mergers and acquisitions; and divisions of cor
Prerequisite: Law 312, 336, and 340. Enrollment may be limite
professor. (Problem Assignments) (Fall and spring—evening)

426 **Introduction to International Economic Law** (2)

Principles and processes of international law relevant to tran
economic transactions between private parties, including prote
aliens (individual and corporate) within national legal systems; p
by states of the economic interests of their nationals; act of state
expropriation, and the protection of alien-owned property; deve
of international law affecting transnational economic transactions
the decisions of national tribunals and through treaties and inte
agreements, adjudicatory jurisdiction of municipal tribunals and
forcement of foreign judgments in the international context; inte
commercial arbitration; special problems of national and inter
regulation of transnational business transactions. Law 426 is recom
as a foundation for Law 427. (Examination) (Fall—day)

427 **Legal Aspects of International Business Transactions** (2) Nurick, Ste

U.S. law and practice, including current tax problems and U.S.
tions on investment; brief comparison with British and civil law s
international law, international contracts, choice of law; currency
erations; effect of SEC laws and regulations; international trade, inc
GATT and reciprocal trade arrangements; sources of finance, both
States and foreign, private and public, including international
tions; protection of property, settlement of disputes, and selec
studies. In addition to the regular lecturers, there will be guest lec
various specialties. Emphasis on current problems in internationa
and investment. (Choice of Research Paper or Examination)
day; spring—evening)

Master of Laws candidates in the area of Corporation Law who have no
the following courses or their equivalent as part of a Juris Doctor or Ba
of Laws program should include them in their Master's program.

312 *Corporations*
313 *Sales and Sales Financing*
329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
340 *Taxation—Federal Income, Corporations and Shareholders*

Other Related Courses

331 *Product Liability*
403 *Public Economic Policy and the Law*
417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
525 *Copyright Law*
526 *U.S. Trademark Law: Selection, Use, Registration, Protection*
Franchising of Trademarks
555 *Taxation—Special Corporation Problems*
562 *Income Taxation of Foreign Business and Investment*

GOVERNMENT PROCUREMENT LAW

Faculty Advisers: J. Cibinic, Jr., G.J. Ginsburg, R.C. Nash, Jr.

431 **Government Procurement Law** (4) Nash, Cibinic
(Formerly 3 credits)

Survey of the law pertaining to government procurement, including an analysis of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in the procurement process. The course focuses on the contract formation process, including techniques for awarding contracts and litigation and protests involving awards. Law 355 is the substantial equivalent of this course. (Examination and Problem Assignments) (Fall –evening)

432 **Performance of Government Contracts** (4) Nash, Cibinic
(Formerly Law 433—3 credits)

Discussion of the substantive problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses, and analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. Analysis of the methods which can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure, actions for breach of contract, and forms of equitable and extraordinary relief. (Examination and Problem Assignments) (Spring—evening)

435 **Seminar: Government Contracts** (2) Nash, Cibinic

Research and discussion of selected problem areas. (Research Paper) (Spring—day)

Other Related Courses

424 *Business Planning*
427 *Legal Aspects of International Business Transactions*
442 *Labor Standards*
446 *Equal Employment Opportunity*
450 *Equal Employment Claims and Litigation*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
535 *Negotiation: Concepts and Techniques*

LABOR LAW

Faculty Advisers: J.M. Albert, L.S. Merrifield, D.P. Rothschild

440 **Seminar: Comparative Labor Law** (2) Merrifield

A comparison of different systems for the regulation of labor and industrial relations in selected countries. Group study of how common problems are handled under these systems; topics may include legal status of collective agreements, worker participation in decision-making, limits on bargaining weapons, procedures for settlement of grievances and jurisdictional disputes, protection against unfair dismissal, and reconciliation of individual, minority, and majority group interests. (Research Paper) (Fall—day)

441 Seminar: Disability Problems (2)

Workman's compensation law, extension of no-fault principle into vehicle area, and national health problems. (Examination) evening)

442 Labor Standards (2)

Analysis of the Fair Labor Standards Act, its scope and exem the Civil Rights Act and other labor statutes; the laws establishing standards for government contracts, including the Davis-Bacon Walsh-Healey Act, Service Contract Act, and Work Hours Act; t of the Department of Labor, the Comptroller General, and the co ing agencies in interpretation, administration, and enforcement of statutes. (Examination) (Spring—evening)

443 Labor Relations in the Federal Service (2)

Study of the Civil Service Reform Act, with emphasis on the structur case law developed by the Federal Labor Relations Authority, F Service Impasses Panel, and Merit Systems Protection Board. Po are drawn between federal sector, non-federal public sector, and p sector decisions. (Research Paper) (Fall—evening)

445 National Labor Relations Board Procedures (2)

A survey of the National Labor Relations Board's unfair labor pr procedures. The course is designed to provide a broad exposure aspects of the National Labor Relations Board's practice, inclu survey of the remedies and the particular procedures utilized b National Labor Relations Board to secure such remedies. Prere a basic labor law course. (Research Paper) (Fall—evening)

446 Equal Employment Opportunity (2)

This course covers the spectrum of federal laws and executive or lating to all types of discrimination in employment, including Title the Civil Rights Act of 1964, as amended by the Equal Employme portunity Act of 1972; the Equal Pay Act of 1963, as amended in the Age Discrimination in Employment Act; the Civil Rights Act of the Fourteenth Amendment; the National Labor Relations Act; Exe Orders 11246 and 11375 relating to government contractors in the "Philadelphia Plan" and other government-imposed "affirmative plans and bid conditions, and Revised Order No. 4 relating to s crimination). The course includes the substantive and procedura available to employees of firms doing business with the governme well as those of other private firms and state and local governmen cies subject to the above federal legislation. (Examination) evening)

447 Seminar: Labor Law (2)

Group study of contemporary problems of labor law. (Research (Spring—day)

448 Seminar: Labor Litigation (2)

Examination of the Supreme Court's work in the labor law fiel emphasis on current and recently decided cases. Facets of Supreme practice and procedure that bear upon labor litigation; litigation str and objectives of institutions and practitioners who practice b before the Supreme Court. Each student will study intensively th relations opinions of an individual Justice, followed by participatory

mock conference of the Justices on a pending or recent case and preparation of a paper analyzing the Justice's views on important labor law issues. Prerequisite: Law 341. (Research Paper) (Spring—evening)

450 **Equal Employment Claims and Litigation** (2) Hartman

Litigation in federal court of a claim of employment discrimination; problems faced by attorneys for both plaintiff and defendant; practice in drafting pleadings which the attorneys for the parties would prepare in litigating a claim of employment discrimination. (Examination) (Spring—evening)

451 **Occupational Safety and Health Legislation (OSHA)** (2) Savelson

This course will review the history of safety and health law in the United States and present an analysis of the interrelationship of various federal and state safety and health laws. The focal point will be the Occupational Safety and Health Act of 1970. By use of commission and court decisions, the course will survey the jurisdictional applicability of the Act and the responsibilities imposed thereunder, and will present an analysis of enforcement and adjudicative procedures. (Examination) (Fall—evening)

452 **Seminar: Public-Sector Labor Law** (2) Chanin

Group study of contemporary problems of labor law. The course is devoted exclusively to problems of the public sector. (Research Paper) (Spring—evening)

aster of Laws candidates in the area of Labor Law who have not taken the llowing courses or their equivalent as part of a Juris Doctor or Bachelor of aws program should include them in their Master's program.

339 *Collective Bargaining and Labor Arbitration*
341 *Labor Law*

ther Related Courses

459 *Problems of the Consumer*
460 *Current Problems in Civil Rights*
566 *Taxation—Deferred Compensation II*

W AND POVERTY

culty Advisers: D.P. Rothschild, J.E. Starrs

459 **Problems of the Consumer** (arr.) **Rothschild and Staff**

(1) *Consumer Protection Center*—Clinical treatment of consumer protection. Students engage in one or more of a number of the Center's projects. For example, "Contact 4" is a project which solves problems received in writing for an Emmy Award-winning nightly television show. "Consumer H-E-L-P" places students in telephone contact with inner-city consumers. The cluster intern program places law students with the District of Columbia Office of Consumer Protection. The Center's federal programs allow students to gain experience in regulatory agencies. Students may also write and publish in the ***Consumer Protection Reporting***

Service. Minimum of eight hours work commitment each week; weekly seminars required in addition for 3 credits. May be repea for a total credit not to exceed six hours.

(2) *Bankruptcy Clinic*—Open to second- and third-year stude dents participate in negotiations with creditors, counsel clients in matters through intensive interviews, and prepare legal petitions ruptcy that may be necessary to assist clients. May be taken fo three credits. One and one-half hour weekly seminar.

The grade *CR* (Credit) or *NC* (No Credit) is given for both of this course. (Fall and spring—day; summer 1980)

460 **Current Problems in Civil Rights** (2)

Uses of law in the effort to achieve racial equality in areas such discrimination against minority groups and the poor in land u zoning, (2) school desegregation, and (3) employment discri The class is divided into groups, each dealing with a problem sit one of these areas. Students represent fictitious clients, write brie argue in class before a student panel of judges, which then w opinion. Grades are based on these written and oral presentation brief critiques of other groups' presentations. Enrollment limited instructor. (Problem Assignments) (Fall—evening)

Other Related Courses

441 *Seminar: Disability Problems*
475 *Law and Criminology I: Search for the Causes of Criminal Be*
476 *Law and Criminology II: Society's Responses to the Crimina*
560 *Taxation—State and Local*
571 *Land Development Planning*
575 *Community Economic Development*
592 *Seminar: Constitutional Law*

LAW, PSYCHIATRY, AND CRIMINOLOGY

Faculty Advisers: T.F. Courtless, Jr., E. Zenoff, G.M. Caplan

473 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer** (2) Starrs, Kogan, W

Designed to acquaint the student with the operations of a modern laboratory and the courtroom acceptability of testimony of forensic tists and other evidence on laboratory test results. Identification dividuals (fingerprints, palmprints, footprints, voiceprints, anthro reconstruction, hair identification, and serology), identification (ballistics, handwriting, typewriting, fiber identification, paints, glass, wood, and paper), toxicology, pathology, forensic use croscope and the camera, the coroner and the medical examiner and drug law enforcement. Visual aids, crime laboratory guest and field trips to crime laboratories. (Research Paper) (Fa ning; spring—day)

475 **Law and Criminology I: Search for the Causes of Criminal Behavior** (2)

Role which criminological knowledge of crime causation may play

sisting lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such casual theories. (Research Paper) (Fall—day)

476 **Law and Criminology II: Society's Responses to the Criminal Offender** (2) Courtless

Study of the development and current use of society's three major approaches to the handling of offenders: punitive, mechanical, and correctional. Emphasis on society's changing responses to criminal and delinquent behavior, and research findings concerning effectiveness of these responses. Analysis of treatment strategies to facilitate communication between members of the legal profession and behavior scientists charged with effectuating these strategies. Prerequisite: Law 475. (Research Paper) (Spring—day)

477 **The Police and the Community** (2) Courtless

Problems and potential of contemporary urban law enforcement; the role and perspective of the police officer; the police *qua* organization; "styles" of law enforcement; law enforcement in the inner city; relationship with ethnic minorities; civil disorder; police-community relations; methods in arrest and investigation; complaint review procedures; science and technology in law enforcement; police handling of juveniles; crime and crime statistics. (Problem Assignments)

479 **Seminar: Criminal Practice** (2) Foster, Weisberg

Tactical and practical applications of criminal law; mastery of techniques in trying criminal cases. Class sessions built around mock problems based on actual criminal cases; student role-playing as defense attorneys and prosecutors. All phases of criminal trial work covered—client relations, investigation, discovery, trial preparation; particular emphasis on courtroom techniques—direct and cross examination, impeachment, refreshing recollection, laying foundations for exhibits, argument, and courtroom demeanor. Though many of the mock problems are written from a defense viewpoint, techniques taught are relevant to both prosecution and defense. Enrollment limited to 15 third-year and graduate students. Prerequisite: Law 334. Students may elect to receive either a numerical grade or the grade *CR* (Credit) or *NC* (No Credit). (Fall and spring—evening)

480 **Law of Criminal Corrections** (2) Cripe

Study of two principal areas: (1) sentencing procedures, including probation, parole, and imprisonment; (2) legal rights of prisoners. Enrollment limited to 25 students. (Examination) (Fall—evening)

485 **Seminar: Health Care Delivery Systems** (2) Johnson

Study of the role of the lawyer in existing and proposed national systems for delivering health care. Students will gain familiarity with the concepts and terms in health care delivery by working with issues in the design, finance, and administration of existing arrangements; examination of the means of reconciling the expectations of various groups of health care service consumers and providers. (Research Paper) (Spring—evening)

486 Seminar: Law and Psychiatry (2) Zenoff,

Designed to expose the lawyer to basic constructs of psyc psychology and to explore their implications in legal rules an Psychiatrists and psychologists actively involved in teachin Topics include psychological testing and other assessment psychiatric evaluations and reports, child custody and other issues, privilege and confidentiality, competency in civil an contexts, criminal law matters (including criminal respons dispositional issues), civil commitment, right to treatment, righ treatment, experimental procedures, and informed consent. Pr counseling, legal ethics, preparation for trial, direct and cross ex and other aspects of practice considered. There is ordinari one session in a mental institution. (Research Paper) (Sp summer 1980)

487 Juvenile Justice (2)

Exploration of the rights of children in intra-family disputes a flicts between the child and the state. Includes the rights of c life (abortion and medical care), a home (neglect and adoptio tion, liberty (status offenses, delinquency, hospitalization for m ability). (Research Paper)

Other Related Courses

390 *Law and Medicine*
591 *Legislative Drafting*
592 *Seminar: Constitutional Law*

LAND USE MANAGEMENT AND CONTROL

Faculty Advisers: J.M. Brown, L.A. Schiller, J.P. Chandler

501 Land Development Law (3)

Study of the basic public and private means used by society to and control land use, such as zoning, subdivision regulation, penalt eminent domain, and privately contracted conditions, covenants strictions. Identification and analysis of emerging new land con esses and the roles played by public and private entities inv affected by land use management and control efforts at the va lons of government. Students participate in a game-simulation representing a specific complex situation in land use conflicts their inherent technological, social, economic, political, and lega In the model situation students will assume roles as attorneys with assigned "clients." (Client-oriented written work and class tion.) Enrollment limited by the instructor. (Fall—day; sum

Brown

504 Seminar: Current Problems in Land Use Controls (2)

New and emerging concepts of regionalism considered in the actual problem situations and attempts being made by various le government to provide effective and equitable land use manage control. Examination of actual problem areas of major concern constitutional, administrative, political, judicial, social, economic nological elements. Functional planning and decision-making

to selected problem areas and their strategical and tactical transactions examined within the compass of the broader policy considerations involved. Guest lecturers; clinical exposure to various government agencies responsible for cooperating with the selected problems. (Research Paper) (Spring—day)

505 **Intergovernmental Relations I** (2) Nash

Study of federalism, emphasizing current techniques for achieving cooperation and coordination between federal, state, and local governments. Detailed consideration of devices used, including interstate compacts, grants-in-aid, and exercise of regulatory powers. (Research Paper) (Fall—day)

506 **Intergovernmental Relations II** (2) Nash

Advanced seminar on multi-government activities and current topics on intergovernmental relations. (Research Paper)

aster of Laws candidates in the area of Land Use Management and Control o have not taken the following courses or their equivalent as part of a Juris octor or Bachelor of Laws program should include them in their Master's ogram.

327 *Modern Real Estate Transactions*
372 *Administrative Law*
508 *Environmental Law I*
509 *Environmental Law II*

er Related Courses

460 *Current Problems in Civil Rights*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
558 *Taxation—Real Estate and Income*
560 *Taxation—State and Local*
591 *Legislative Drafting*
593 *Seminar: American Legal History*

VIRONMENTAL LAW

ulty Adviser: A.W. Reitze, Jr.

508 **Environmental Law I** (3) Reitze

A survey of the laws administered by the U.S. Environmental Protection Agency—water pollution, noise, toxic substances, etc. An in-depth analysis of the Clean Air Act, using that Act to focus on legal problems common to environmental law. (Examination) (Fall—day; spring—evening)

509 **Environmental Law II** (3) Reitze

A continuation of Law 508. Topics covered in this course vary. (Examination) (Spring—day)

510 **Water Resources Law** (2) Hedeman

Federal/State powers over water: riparian and prior appropriation doctrines; Indian and reserved rights; groundwater law. Federal programs for

water resources development; federal permit programs. Wetlan
and coastal zone management. (Examination) (Fall—even
1980)

511 Environmental Planning (2)

Introduction to environmentalism in land use planning, zoning
controls, growth control. State and federal land use planning.
of environmentally sound planning. Enrollment limited to
A second-level property course is recommended prior to this
search Paper) (Fall—evening)

512 Energy (2)

Survey of federal energy regulation of the major energy indu
phasis on federal controls affecting the oil, natural gas, coal,
industries. The course approaches energy regulation from
and case standpoint, and also deals with practical, procedural
rollment limited to 35 students. Recommended for third-ye
(Examination) (Spring—evening)

513 Environmental Litigation (2) Miller, Steec

Special problems of environmental lawsuits. Topics include
procedural problems, selection of the proper court, problems
remedies, selection of parties, discovery techniques and trial p
and the use of expert witnesses and scientific evidence. P
third-year or graduate status. Enrollment limited to 35 student
Assignments) (Fall—day; spring—evening)

514 Natural Resources Law (2)

Introduction to public lands; recreation, forestry, grazing, and m
Continental shelf development, Alaskan development, western e
velopment. Wilderness Act, wild and scenic rivers, national trail
issues are a major focus of the course. Recommended for s
third-year students. (Examination) (Fall—evening)

515 Water Pollution Control Law (2)

A detailed analysis of the Federal Clean Water Act. Other federa
with water pollution implications are examined, including the
Protection, Research and Sanctuaries Act, Ports and Waterway
Act, Outer Continental Shelf Lands Act, Deepwater Ports Act,
Drinking Water Act. Recommended for second- or third-year
(Examination) (Spring—day)

516 Clinical Studies in Environmental Law (2, 3, or 4)

The student works on a project in the environmental law field
supervision of both the faculty director of the program and
practicing environmental law. The project may involve working
government agency, a congressional committee, a private pra
a nonprofit public-interest environmental organization. Admission
course requires second-semester second-year, third-year, or gradu
ing and permission of the Director of the Environmental Law
Students who have mastered the fundamentals of environmenta
selected for this course. Normally this will require completion o
Law 508. Students may repeat this course for a maximum of 5
hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is
this course. Five hours of work per week are required for
(Fall and spring—day)

517 **Control of Toxic and Hazardous Substances** (2) Roisman

A problem-oriented course emphasizing the use of legal procedures to protect the environment from toxic substances. The Resource Conservation and Recovery Act, Toxic Substances Control Act, and numerous other statutes with toxic control provisions are examined. Recommended for third-year students. (Writing Assignments) (Fall—evening)

518 **Use and Control of Nuclear Energy** (2) Malsch

(Formerly Law 494)

Development of law and legal institutions to deal with scientific developments in nuclear energy. Laws and regulations concerning peaceful uses of nuclear energy, including licensing, safety, environmental, security, and antitrust considerations. (Research Paper) (Spring—evening)

aster of Laws candidates specializing in Environmental Law or Land Use anagement and Control may use the following courses to complete the degree requirements.

598 *Research in Public Law*
599–600 *Thesis*

ther Related Courses

327 *Modern Real Estate Transactions*
413 *Public Policy and Mass Media*
431 *Government Procurement Law*
451 *Occupational Safety and Health Legislation*
501 *Land Development Law*
504 *Seminar: Current Problems in Land Use Controls*
532 *International Law of the Sea*
560 *Taxation—State and Local*
572 *Land Development Planning*
591 *Legislative Drafting*

ATENT AND TRADE REGULATION LAW

aculty Advisers: I. Kayton, G.R. Weston

522 **Patent and Know-how Licensing** (2) Brunsvold

The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 359. (Choice of Research Paper or Examination) (Spring, odd years—evening)

523 Court Review of Patent Office Decisions (2)

Procedure and procedural law involved in appealing to the U.S. Customs and Patent Appeals and the U.S. District Courts from trative decisions in the U.S. Patent Office. Designed to provi haustive step-by-step procedural progression through *ex parte* *partes* patent and trademark appeals. Emphasis on the forms u many motions and proceedings before the U.S. Court of Cu Patent Appeals and the District Courts required to perfect a Attendance at and critique of actual court proceedings. In material includes administrative appeals before the U.S. Pat Board of Appeals. Prerequisite: Law 359 and 362, or the equ experience. (Examination) (Spring—evening)

524 Chemical Patent Practice (2)

Seminar covering patent application preparation, prosecution, and licensing which are peculiar to chemical patent practice. Pre Law 359 and 362, or comparable experience in the practice of pa (Examination) (Fall, even years—evening)

525 Copyright Law (3)

Historical background; formalities and essentials in securing a subject matter of copyright; remedies; international aspects of under Berne Union, Universal Copyright Convention, Inter-Ameri vention; copyright licensing and performing rights societies. (E tion) (Spring—evening)

526 U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks (2)

Procedural and substantive law on use, registration, and protec trademarks, including detailed registration procedure in the U.S and Trademark Office, common law rights to marks, and licen franchising arrangements. Prerequisite: Law 329. (Examination odd years)

528 Patent Interference Practice (2)

Procedure and practice in inter partes determination of priority tion in the U.S. Patent Office. Topics: conception, reduction to diligence, corroboration, preliminary statements, motions, tim mony practice and final hearing. Also covered are current proce such as inventor determination, discovery, and privilege. Stud quired to draft procedural document selected from categories of nary statements and various interference motions. Prerequisite 359 and 362. (Examination)

529 Research in Patent, Trademark, and Copyright Law (2)

Prerequisite: Law 417, and related courses; and a *B* average. Re writing, with proposed outline of topic of research, must be subm the Dean at least one month prior to registration day. Work m completed within the semester and paper submitted not later than of classes. Graduate students may repeat this course once for cre the approval of the Dean. (Research Paper)

Master of Laws candidates in the area of Patent and Trade Regulation L have not taken the following courses or their equivalent as part of a Ju tor or Bachelor of Laws program should include them in their Master's pro

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
359 *Patent Law*
362 *Patent Office Practice*

Other Related Courses

412 *Food and Drug Law*
417 *Seminar: Trade Regulation*
427 *Legal Aspects of International Business Transactions*
431 *Government Procurement Law*
492 *Seminar: Science and the Legal Process*
562 *Income Taxation of Foreign Business and Investment*

INTERNATIONAL AND COMPARATIVE LAW

Faculty Advisers: International Law—W.T. Mallison
Comparative Law—G.R. Delaume, W.T. Mallison

531 **International Law of Air and Space** (2) Dembling, Hosenball

Study of the development of international law relating to the use of air space and outer space; analysis of air and space treaties in force; the role of various intergovernmental and nongovernmental international organizations; consideration of special problems such as liability resulting from space activities, space technology and arms control, and pollution and contamination of outer space: earth resources, sensing, etc. Enrollment limited to 25 students. (Research Paper) (Fall—evening)

532 **International Law of the Sea** (2) Muys, Nordquist

International law affecting allocation of authority over ocean space. Development of international law concerning territorial sea, contiguous zone, high seas, continental shelf, and deep seabed. Current legal and policy issues associated with these areas. (Examination) (Spring—evening)

533 **International Humanitarian Law of Coercion Control** (2) Mallison

Process of legal decision concerning international conflicts and civil wars, including the protection of war victims, control of international terrorism, problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)

534 **U.S. Foreign Relations Law** (2) Chandler

Seminar involving the study of foreign relations law. Materials to be read and discussed relate to the Constitutional and other public law problems which arise in the development and conduct of U.S. foreign relations. (Research Paper) (Fall—evening)

535 **Negotiation: Concepts and Techniques** (2) Ramundo, Tankel

Roles of the attorney-negotiator and principal (client) in the private, intra-organizational, and international negotiating environments; the "think

negotiation" mentality and a suggested conceptualized approach negotiation process, including the definition of negotiation, fou of negotiation, and operational checklists; negotiating techniques, presentational considerations and the use of persuasion, tactics and classic do's and don't's lists; theories of the opening position cession-making. Practical exercises in the actual conducting of nego Enrollment limited by the instructors. (Writing Assignments) —evening; summer 1980)

536 Diplomatic and Consular Law and Practice (1)

Development of diplomatic and consular relations between nation rights, privileges, functions, and immunities of diplomatic and personnel; extent of immunity from jurisdiction of foreign gov missions and representatives; problems of taxation affecting forei ernment missions and personnel. (Research Paper)

537 The International Law of Human Rights (2)

Development of the rights of man from Grotius through the A and French Revolutions to the work of the United Nations in th human rights: the individual vis-a-vis the State; the regional appr international protection of human rights, with emphasis on the E Convention; the inter-American, African, and Socialist approaches rights in armed conflict; and terrorism as a basic deprivation of rights. (Research Paper) (Fall—evening)

540 Choice of Law and Forum in Transnational Contracts, Techniques of Conflict Avoidance (2)

Problems confronting the practitioner who endeavors to anticipa flicts before they arise. Conflicts rules for transnational contracts nationalization of contracts involving sovereign and international zations. Techniques of conflict avoidance; express choice of law flict avoidance in absence of express stipulation of applicable law fectiveness of conflict avoidance; interrelationship of conflicts law comparative law. (Research Paper)

542 U.S. Regulation of International Trade (2)

Study of theory and practical application of United States law lations, and governmental infrastructure affecting international Public international fora and agreements influencing U.S. regula GATT, the MTN, UNCTAD, and treaties of friendship, commer navigation; constitutional basis for U.S. government regulation o national trade; exemplary areas of trade regulation: Export Adm tion Act, foreign assets control, tax, Foreign Corrupt Practi Arab boycott regulations, antitrust, countervailing duties, impor for domestic industries, East-West trade, generalized system of ences and tariff nomenclature. (Examination) (Spring—even

546 Soviet Law (2)

Concept of "socialist legality"; legal relationship of individual to gov other participants in Soviet society; role of Party in Soviet legal s Soviet philosophy of law; state (constitutional) law: Soviet fed governmental apparatus, rights and obligations of citizenship; c law; property law; labor law; selected topics in civil law and proc international law. (Choice of Paper or Examination) (Fall

547 **Chinese Law** (2) **Hsia**

Emphasis on the legal system of Communist China; analysis of the constitutional law of China, including general principles, state structure, and rights and duties of citizens; a brief survey of the administration of justice—courts, procuratorates, and lawyers; marriage law; land law; counter-revolutionary act and other criminal statutes; principles of civil law; Communist Chinese concept of international law. (Research Paper) (Fall—evening)

548 **Law of the Near East** (2)

Law of the Arab countries, Turkey, and Iran, including basic principles of Islamic law, analysis of the present day codes, and investigation of the Western influences on laws of these countries. (Research Paper)

of Laws candidates in the area of International and Comparative Law ave not taken the following courses or their equivalent as part of a Juris or Bachelor of Laws program should include them in their Master's m.

302 *Admiralty*
303 *International Law and World Order*
304 *United Nations Law and World Order*
307 *Comparative Law*
309 *Conflicts of Laws*

Related Courses

327 *Legal Aspects of International Business Transactions*
340 *Comparative Labor Law*
494 *Use and Control of Nuclear Energy*
562 *Income Taxation of Foreign Business and Investment*
586 *Immigration Law*

TION

Advisers: J.R. Hambrick, D.B. Weaver, L.D. Solomon

51 **Taxation—Partnerships and Subchapter S** (2) Weaver, Sanders

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Practice-oriented study of partnerships, including syndication, organization, and structure of entity, with emphasis on policy examination of areas of IRS principal concern, including tax shelters, disproportionate tax allocations, retroactive allocations, guaranteed payments to partners, contributions of capital, basis for gain or loss, non-recourse financing, "at-risk" rules, current and liquidating distributions, sale of partnership interests, collapsible partnerships, "like-kind" exchanges, termination, special basis adjustments, and distributions to retiring or deceased partners. Planning-oriented analysis of Subchapter S, including procedures for electing and

terminating Subchapter S status, treatment of income and lo
tions on deductibility of losses, and how to avoid pitfalls. (E
(Spring—evening)

553 **Seminar: Estate Planning** (2 or 3) Weaver, McCo

Study of the effective disposition of wealth by inter vivos gif
mentary transfer; emphasis on income, estate, and gift tax con
use of the trust form in the transfer of wealth; use of inst
jointly held property as part of the estate plan; planning for th
ation or disposition of the client's business interests. Prepara
estate plan, with supporting documents is the major project for
Prerequisite: Law 325, 326, 336, and 338. Enrollment limi
instructors. Solomon, Weaver (Problem Assignments); McCoy
Problem Assignments or Research Paper) (Fall—evening
1980)

555 **Taxation—Special Corporation Problems** (2)

Detailed study of the principal federal tax benefits of the corp
of doing business. Consideration of problems involved in the ta
of the corporate structure and corporate operation, including th
nition of a corporation, the special deductions available to
payers, the compensation of the corporate executive and emp
debt-equity question, the accumulated earnings tax, the personal
company tax, multiple corporations, and consolidated returns.
the types of corporations receiving special treatment under the
Revenue Code, such as financial institutions, real estate investm
regulated investment companies, cooperatives, and small business
tions. Prerequisite: Law 340. (Research Paper) (Spring

557 **Taxation—Exempt Organizations** (2)

Tax-exempt organizations: policy and practice of preferred tax
for selected organizations and gifts to them. Statutes, regulat
IRS practice; legislative origins, judicial interpretations, and pol
sideration. Tests of qualification, disqualification, and limited pu
ence. Mechanics of securing and retaining exemption; qualifie
tion; unrelated business income; private inurement. political ac
nial or loss of exemption. Return and reporting requirements.
tive tax treatment of nonexempt and nonprofit organizations.
sanctions with respect to private foundations, managers, and d
improper, excessive, or prohibited activities. Enrollment may be
Prerequisite: Law 336. (Examination) (Fall—evening; sum

558 **Taxation—Real Estate and Income** (2)

The effect of income taxes on the real estate market and real estat
actions: sales and exchange of real estate interests; various entities
ownership and development of real estate; the impact of taxes
landlord and tenant; the impact of taxes on the mortgagor and mo
including the choice of financing techniques, such as the sale-lea
depreciation, amortization, and obsolescence; basis and basis adjus
and casualties and other involuntary conversions. Prerequisite:
(Examination) (Spring—evening)

559 **Taxation—Oil and Gas** (2)

Application of federal income tax law to producing segment of t
gas industry. Classification of interests; treatment of exploration

velopment expenditures. Depletion allowance and concept of "economic interests." Sales vs. "leasing" transactions. Organization problems. Prerequisite: Law 336. (Examination) (Spring—evening)

560 **Taxation—State and Local** (2) Drabkin

Taxation by state and local governments; problems of real and personal property taxation, sales and use taxes, business and personal income taxes. Limitations on taxation of interstate commerce. Congressional problems. (Choice of Research Paper or Examination) (Spring—evening)

562 **Income Taxation of Foreign Business and Investment** (2) Hambrick, Brockway, Nauheim

The provisions and policies of the federal income tax law applicable to foreign income, including considerations affecting the choice of methods of engaging in foreign business and investment, treatment of controlled foreign corporations, allocation of income in foreign commerce, credit for foreign taxes, principles and trends of U.S. tax treaties. (Examination) (Spring—evening)

564 **Seminar: Special Problems of Tax Policy** (2) Singer

Intensive study of selected aspects of the tax structure with primary attention given to the federal income tax. Problem areas are reviewed primarily from the standpoint of tax policy, including legal, economic, social, and practical considerations. Alternative solutions, including current legislative proposals, are examined. Prerequisite: Law 336, 340. (Research Paper) (Fall—evening)

565 **Taxation—Deferred Compensation I** (2) Chabot, Lieber

(Formerly Law 554)

Tax and labor law consequences of deferred compensation. Examination of new standards imposed by Employee Retirement Security Act of 1974. Consideration of tax consequences of "unqualified" plans, lump sum distributions, individual retirement accounts, and new requirement that defined benefit plans be insured by the Pension Benefit Guaranty Corporation. Prerequisite: Law 336. (Problem Assignments and Examination) (Fall—evening)

566 **Taxation—Deferred Compensation II** (2) Chabot, Lieber, Klevan, I. Cohen

Nonqualified arrangements: constructive receipt, cash equivalent, I.R.C. §§ 83 and 404, and individual retirement accounts. Qualified plans: deductions, distributions (annuities, lump-sum distributions, rollovers, employer stock), ESOPs, termination insurance, fiduciaries and service providers (reporting, disclosure, fiduciary standards, self-dealing), estate and gift tax, unrelated business income, simplified pension plans, and master and prototype plans. Law 336 recommended but not required prior to taking this course. Neither a tax background nor Law 565 (formerly Law 554) is prerequisite. (Examination) (Spring—evening)

567 **Seminar: Tax Practice and Procedure** (2) Timbie, Lewis

Review of the major areas of tax practice, including organization of the Internal Revenue Service, legislation, administrative regulations, tax planning, tax rulings, tax audit, settlement procedures, claims for refund, tax collection processes, criminal tax practice, and ethical problems in tax

practice. Preparation of various documents is required. Pr
5 semester hours of taxation, including Law 336. (Problem As
(Fall—evening)

568 **Seminar: Federal Tax Litigation** (2)

Choice of forum. Conduct of civil tax cases: trial practice i
Court, the District Courts, and the Court of Claims; appeal pra
Courts of Appeals and on certiorari to the Supreme Court; a
drafting of pleadings, motions, and briefs; oral argument; settle
stipulations of fact. Comparative responsibilities and procedu
and of the Department of Justice for litigation control. Prereq
567. (Writing Assignments) (Spring—evening)

569 **Community Property** (2)

Comparative study of the marital property law of eight states
California, Idaho, Louisiana, Nevada, New Mexico, Texas, a
ington) which derive their law on this subject from Spanish
civil law sources rather than the common law. Both the tradi
cepts and the diverse modern statutory modifications are
Specific subjects include questions of classification of proper
munity or separate, consequences to the spouses, transferees, c
of each classification, and special constitutional, conflict of law
eral tax questions produced by the community property chara
(Short papers on the law of a paricular state and examination
—day; offered alternate years)

Master of Laws candidates in the area of Taxation who have not take
lowing courses or their equivalent as part of a Juris Doctor or Ba
Laws program should include them in their Master's program.

336 *Taxation—Federal Income*
338 *Taxation—Federal Estate and Gift*
340 *Taxation—Federal Income, Corporations and Shareholders*
351 *Law and Accounting*

Other Related Courses

404 *Securities Regulation*
424 *Business Planning*
427 *Legal Aspects of International Business Transactions*

URBAN LEGAL STUDIES

Faculty Advisers: M. Pock, D.P. Rothschild

572 **Land Development Planning** (2)

Selected problems in urban and regional planning: applications
urban renewal, and special programs available for the implemen
development plans. Enrollment limited by the instructor. (Ess
and Paper) (Spring—evening)

575 **Community Economic Development** (2)

A substantive study of the organizational, financial, and tax-p
pects of nonprofit, cooperative, and small business organizat
lems illustrating some of the legal considerations of a nonpro

zation and a small business. Consideration of the problems of economic development and current efforts to stimulate it. Enrollment limited to 25 students. Prerequisite: Law 312, 336. (Problem Assignments)

579 **Clinical Studies in Urban Law** (arr.) Sirulnik and Staff

(1) *Civil Litigation Clinic*—Open to third-year students. Students represent indigent litigants in the Small Claims, Family, Landlord/Tenant, and Civil Divisions of the D.C. Superior Court. Work responsibilities include client interviewing, investigation, settlement negotiations, preparation and argument of motions, as well as conducting actual trials. Two-hour weekly seminar.

(2) *Criminal Appellate Clinic*—Open to third-year students. Students participate in preparing actual criminal cases on appeal, starting with review of trial transcript and culminating with preparation of brief and oral argument before U.S. Court of Appeals for the District of Columbia Circuit. Appellate practice and procedure studied through texts; consultation with appellate judges, law clerks, and attorneys with cases pending on appeal; observation of arguments in the Supreme Court and the Court of Appeals. Two-hour weekly seminar.

For both sections, admission by permission of instructor; students must submit applications during spring term of preceding year. Must be taken for 4 credit hours per term for the entire academic year, or 2 credits carried over both summer sessions. (Fall, spring, summer)

Descriptions for the other courses in this area (listed below) appear elsewhere in "Advanced Courses."

459 **Problems of the Consumer** (2 or 3)
501 **Land Development Law** (3)
505 **Intergovernmental Relations I** (2)
506 **Intergovernmental Relations II** (2)
560 **Taxation—State and Local** (2)

Other Related Courses

460 *Current Problems in Civil Rights*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
592 *Seminar: Constitutional Law*

OTHER ADVANCED COURSES

585 **Computers and the Law** (3) Chandler
(Formerly Law 491)

A critical study of selected major legal problems presented by new computer technology, including the impact upon legal doctrine and legal institutions. Jurimetrics, the theory of various uses that are and may be made of computers in legal research, the practice of law, and court administration will be examined. Familiarity with the rudiments of computer science or programming would be helpful, but is not required. (Examination) (Summer—1980)

586 **Immigration Law** (2) Mancini

Law and practice under the McCarran-Walter Act, involving questions of immigration, emigration, expatriation, nationality and naturalization. Con-

sular, Immigration and Naturalization Service, and Labor D
practice. (Examination) (Fall—evening)

587 **Individual Rights and Liberties** (3)

Principles of equality and due process in the 5th and 14th am
The power of Congress to enforce the 14th amendment. Focu
dividual rights and liberties under the U.S. Constitution. First
ment rights, particularly religion and speech clauses. The righ
sociation. Other personal rights in the Bill of Rights. Method
judges in deciding cases involving individual rights and liberti
ularly the "balancing test" and the judges' views of societal
Prerequisite: Law 212. (Research Paper) (Fall—day)

588 **Legal Problems in Education** (2)

Public policy issues involving individual liberties and governme
gations examined in the context of government's participation
tion. Issues covered include legal framework within which states
schools, rights of students and teachers, obligations to avoid discri
and provide equal educational opportunities, and role of courts,
tors, and educational officials in resolving such issues. (Research

589 **Seminar: Law of Privacy** (2)

A review of the law of privacy as it has developed in constitution
tion, tort law, and state and federal statutes. Current developme
rationales for further expansions of privacy rights are considere
search Paper) (Summer 1980)

591 **Legislative Drafting** (2) Zweben, Wi

Advanced instruction and practice in legislative drafting; overview
islative process with emphasis on legislative drafting. Enrollment
to 30 students. (Problem Assignments) (Fall and spring—evening

592 **Seminar: Constitutional Law** (2) Cheh, Dienes,

Group study of contemporary problems in constitutional law; pro
constitutional litigation; problems of effectuating constitutional gua
Limited enrollment. (Research Paper) (Fall—day; spring—eve

593 **Seminar: American Legal History** (2)

From the outbreak of the Revolution at Lexington and Concord
death of John Marshall. An examination of men, events, and mov
significant in the unfolding of our laws and legal institutions in this
tive period of our national life, including a critical examination
place of the lawyer in a revolutionary age. Comparison of the role
lawyer during the politically and socially unsettled time of Marsha
the role of the lawyer in today's troubled scene. Members of the
present the results of their research and thought either by oral or
reports. The grade of *CR* (Credit) or *NC* (No Credit) is given
course. (Problem Assignments) (Fall—as arranged)

Sharpe,

594 **Professional Responsibility** (2)

Ethical problems in civil and criminal litigation. Loyalty to the
Financing of legal services. Etiquette of acquiring and retaining
Procedures and problems in legal discipline. Special responsibilities
government lawyer. Ethical conduct of judges. Issues in *pro bono*
practice. Ethical responsibilities of law professors. Plea bargaining
of the American Bar Association. (Examination) (Spring—
evening)

596 **Graduate Clinical Studies** (1, 2, 3, or 4) **Staff**

Practical experience in the student's area of specialization or interest. The student may work with a government agency, congressional committee, court, or other such entity performing tasks normally assigned to an attorney. Course approval must be obtained from the student's faculty adviser and/or the Dean. A maximum of four credit hours may be applied toward graduation. For each credit hour, 56 hours of non-remunerated work must be performed. A written report describing in some detail the specific work performed and evaluating the experience received is required. For post-J.D. students only. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer)

597 **Independent Studies** (arr.) **Staff**

Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fall and spring)

598 **Research in Public Law** (2) **Staff**

Limited to graduate students with at least a *B* average who have had a seminar or comparable course in field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall, spring, summer)

599–600 **Thesis** (2–2)

Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer)

620–21 **Legal Research, Writing, and Professional Responsibility and Ethics** (1–1)
(For Foreign Students)

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit, a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)

SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

ENVIRONMENTAL LAW PROGRAM

Director A.W. Reitze

The Environmental Law Program provides course work for J.D. ca
and a specialty LL.M. program for lawyers. The formal course work p
the most extensive coverage in this field of any law school in the nation.
present time, eleven courses are offered. In addition, there are many
law course offerings, particularly in land use planning, that are avail
clinical program allows students to receive academic credit for internshi
government agencies and non-profit environmental litigation groups. Re
courses allow students to pursue individual interests under faculty gu
or to participate in faculty research projects.

GOVERNMENT CONTRACTS PROGRAM

Director R.C. Nash, Jr.

A comprehensive government contracts program provides continuing
tion for industry and government personnel in this field and a progra
courses leading to the Master of Laws degree in Government Procur
Law. The program includes (1) short seminars, (2) one-week courses
vanced problems in the field, (3) an annual institute treating a probl
contemporary importance, (4) an annual conference in a major area, (5)
pilation of materials for use in current courses, (6) publication of a ser
monographs treating special problems in the field, and (7) special re
projects.

INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Director W.T. Mallison

The objectives of the International and Comparative Law Program are to
vide insights, skills, and substantive understanding of international law
foreign legal systems. Specific objectives in international law are to provid
understanding of decision-making, sanction processes, legal institutions, and
relationships between domestic and international law. Specific objectives
comparative law include understanding of the basic institutions of civil
countries, the reception of civil law and common law in non-Western countr
and the role of decisional law and judicial review in selected legal syste
Improvements which are needed to promote the rule of law in the world c
munity are also considered. International aspects of business transactions
economic development are included in the Program. The objectives of
Program are implemented through course work and seminars for both J.D.
post-J.D. degree students and through research and writing in pertinent fie

ND USE MANAGEMENT AND CONTROL PROGRAM

ector J.M. Brown

e social, economic, technological, political, and legal interrelationships gen-ted by the fact that land is a basic, limited-supply natural resource, capable being subjected to differing but concurrent public and private uses, raise a wing number of issues involving management policy and control measures ch are of critical concern to the future of the nation. The Land Use Man-ment and Control Program, through a combination of academic, clinical, game-simulation processes, seeks to provide an understanding of existing pending problems, needs, means, and opportunities for solution with respect his developing area of national concern.

TENT LAW PROGRAM

ector Irving Kayton

Patent Law Program is designed for students in the J.D. and Post-J.D. ree programs whose intentions are to specialize in the practice of patent law. ing the past eight years an organized program has been developed to offer omplete and as integrated a collection of courses in patent law as possible. course offerings in patent law now total 17 semester hours, far more than other law school in the United States. In addition, courses in trademark copyright law are also available (see the "Patent and Trade Regulation area of specialization in the "Advanced Courses" section of this bulletin complete list and detailed description of the patent law courses offered). bject of the Patent Law Program is to provide the student with a concen-ion in patent law at a level of specialization and maturity which will enable ancement more rapidly in this field.

THE GEORGE WASHINGTON LAW ASSOCIAT

Director of Law Alumni Relations Clifford A. Dougherty, J.D.(W.H.

The George Washington Law Association was founded in 1912 a affiliated with the General Alumni Association since 1926. Its stated in the constitution are to promote high standards of legal e keep the alumni of the school in close touch with one another, esp members of their own classes, to gather and publish at intervals inf to the whereabouts and activities of these alumni, and to further of the school.

Eligible members are those who have matriculated in the school University and have left in good standing, and any member or form of the faculty of the school. Active members are those eligible m are current contributors to the Law Annual Support Program of th and life members of the George Washington Law Association.

The Association plans publication periodically of the Law Alumn Law alumni are urged to keep the Alumni Office informed of t abouts so that directory information can be kept up to date.

The Law Alumni Office is in the University Library, 2130 H S Washington, D.C. 20052.

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THE UNIVERSITY

HISTORY AND ORGANIZATION

The George Washington University had its beginning in 1821 as T
bian College in the District of Columbia. The name of the insti
changed in 1873 to Columbian University and in 1904 to The Geo
ington University. The debt of the University to George Washing
name it bears, is an intangible one.

George Washington, as President and as private citizen, had urged
upon the establishment of a National University in the Federal City
hoped that, while being instructed in the arts and sciences, students
parts of the country would acquire the habits of good citizenship, the
local prejudices and gaining at first hand a knowledge of the practice
the theory, of republican government. To further the materialization
hopes, Washington left a bequest of fifty shares of The Potomac Com
wards the endowment of a University to be established within the li
District of Columbia, under the auspices of the General Governme
government should incline to extend a fostering hand towards it." T
gress never extended "a fostering hand." The Potomac Company pass
existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by
missionary urge and the need for a learned clergy, a group of dedica
isters and laymen sponsored a movement for the establishment of a
the District of Columbia. Inspired largely by the zeal and energy of
end Luther Rice, they raised funds for the purchase of a site and
Congress for a charter. After much delay and amendment, Congress
charter which was approved by President Monroe on February 9,
safeguard the College's nonsectarian character it provided "that no
every religious denomination shall be capable of being elected Tr
shall any person, either as President, Professor, Tutor or pupil, be re
mittance into said College, or denied any of the privileges, immuni
vantages thereof, for or on account of his sentiments in matters of re

During the entire time when the institution was known as Columbi
its activities were centered on College Hill, a tract of forty-six and a
between the present Fourteenth and Fifteenth Streets extending north
ida Avenue to somewhat beyond Columbia Road. The Medical S
located downtown. For the better part of the Columbian University
buildings of the University were situated along H Street between Thirte
Fifteenth Streets.

During the last half century the University's present plant has been
in that section of the old First Ward familiarly known as "Foggy
between Nineteenth and Twenty-fourth Streets, south of Pennsylvania
The area contains several reminders of historic interest to the Univers
ident Monroe, who signed the Charter, lived at 2017 Eye Street. The
ident of the Board of Trustees, the Reverend Obadiah B. Brown, was
years the pastor of a church at Nineteenth and Eye Streets, and was

elected Twenty-third and E Streets as the site of the National University he ad hoped to see established.

The University as it is now organized consists of Columbian College of Arts nd Sciences (undergraduate); the Graduate School of Arts and Sciences; the rofessional schools, which include the National Law Center and the schools f Medicine and Health Sciences, Engineering and Applied Science, Education, overnment and Business Administration, Public and International Affairs; the ollege of General Studies; the Division of University Students; the Summer essions; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by self-perpetuating Board of Trustees of which the president is an ex officio ember.

CADEMIC STATUS

he George Washington University is accredited by its regional accrediting gency, the Middle States Association of Colleges and Secondary Schools. The niversity is on the approved list of the American Association of University omen and is a member of the College Entrance Examination Board.

OCATION

he University is in downtown Washington, between Pennsylvania Avenue and yn. F, and 24th Streets, N.W. In immediately adjacent areas are the White ouse, the World Bank, the International Communication Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, e General Services Administration, the National Academy of Sciences, and e Kennedy Center for the Performing Arts.

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	1st year	*2nd year*	*3rd year*	*4th year*	*Graduate*	*Other*
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Evening	103	107	86	86	165	36

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COLLEGES AND SCHOOLS—DEGREE PROGRAMS

OLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Asso-iate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in artographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. n Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), achelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. n Cart. Sc.) and Bachelor of Science in Geodesy (B.S. in Geod.)

RADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of rts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Mas-er of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Sci-nce (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of cience in Forensic Science (M.S.F.S.), Master of Science in Special Studies M.S. in Sp.Std.) and Doctor of Philosophy (Ph.D.)

CHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), achelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H Sc.) and Doctor of Medicine (M.D.)

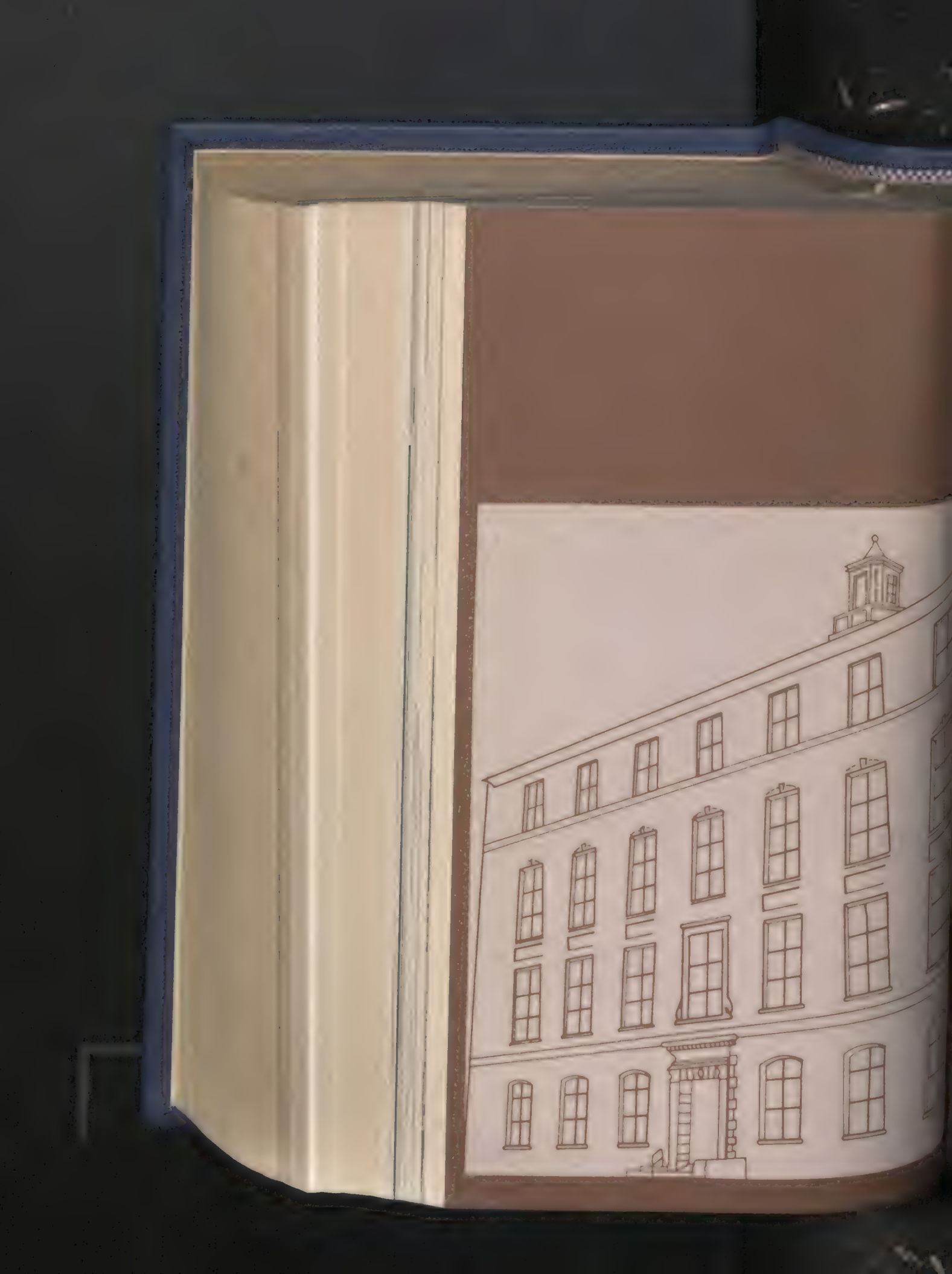
ATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Mas-er of Comparative Law (M.Comp.L.), Master of Comparative Law (Ameri-an Practice) (M.Comp.L. (Am.Prac.)) and Doctor of Juridical Science S.J.D.)

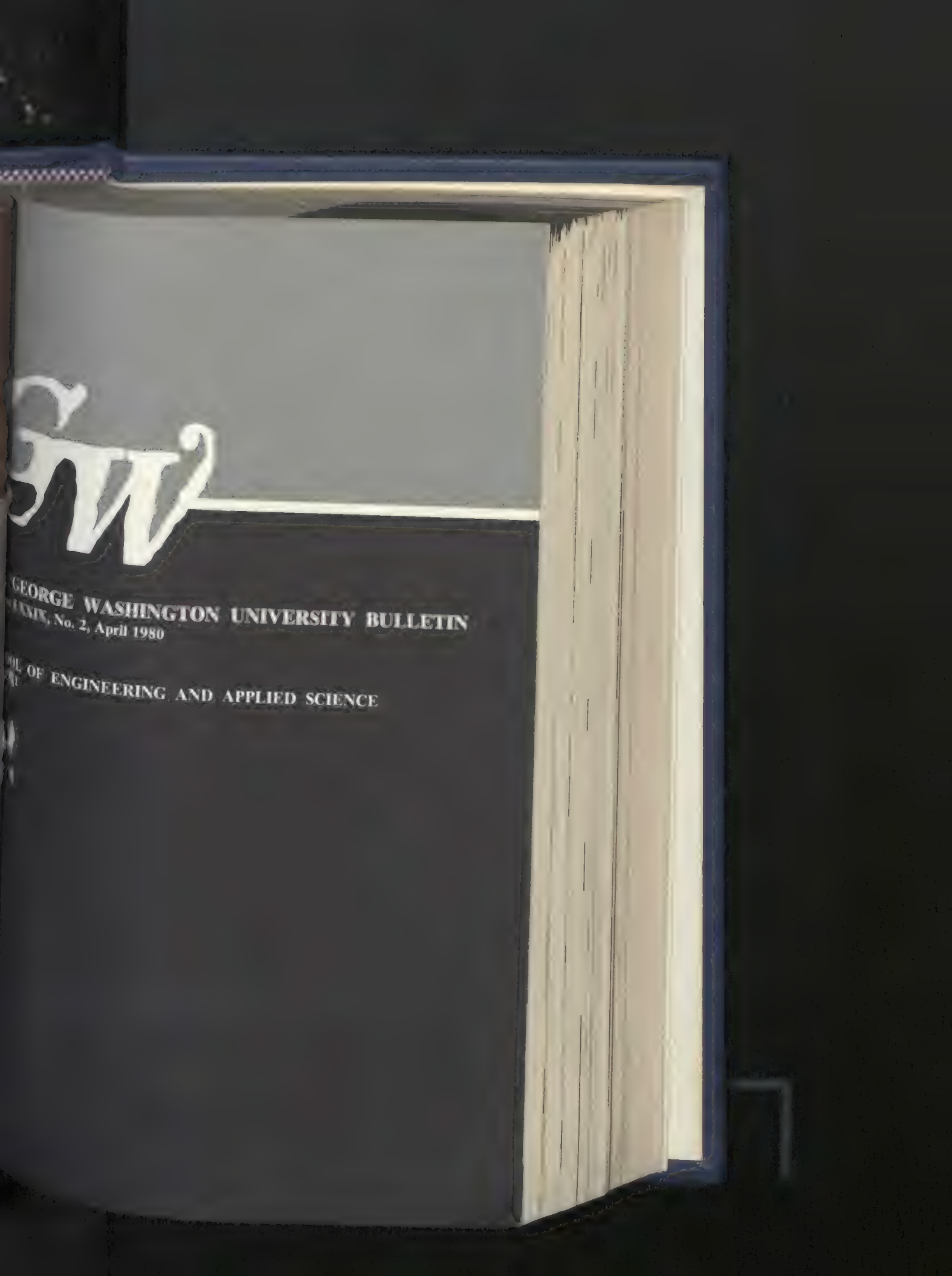
CHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil En-ineering) (B.S. (C.E.)), Bachelor of Science (Electrical Engineering) (B.S. E.E.)), Bachelor of Science (Mechanical Engineering) (B.S. (M.E.)), Bachelor f Science (Operations Research and Computational Science) (B.S. (O.R.& S.)), Master of Engineering Administration (M.E.A.), Master of Science M.S.), Engineer (Engr.), Applied Scientist (App.Sc.) and Doctor of Science D.Sc.)

CHOOL OF EDUCATION AND HUMAN DEVELOPMENT: Bachelor of Arts in Educa-ion and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in uman Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in ducation and Human Development (M.A. in Ed.&H.D.), Master of Arts in eaching (M.A.T.), Education Specialist (Ed.S.) and Doctor of Education Ed.D.)

CHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business dministration (B.B.A.), Bachelor of Science in Health Care Administration B.S. in H.C.A.), Master of Accounting (M.Acct.), Master of Business Ad-inistration (M.B.A.), Master of Health Services Administration (M.H.S.A.), aster of Public Administration (M.P.A.), Master of Science in Information ystems Technology (M.S. in I.S.T.), Master of Urban and Regional Planning M.U.&R.P.), Post-Master's Graduate Certificate in Health Services Admin-tration (Grad.Cert. in H.S.A.), Doctor of Business Administration (D.B.A.) nd Doctor of Public Administration (D.P.A.)

CHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.) and aster of Arts (M.A.)

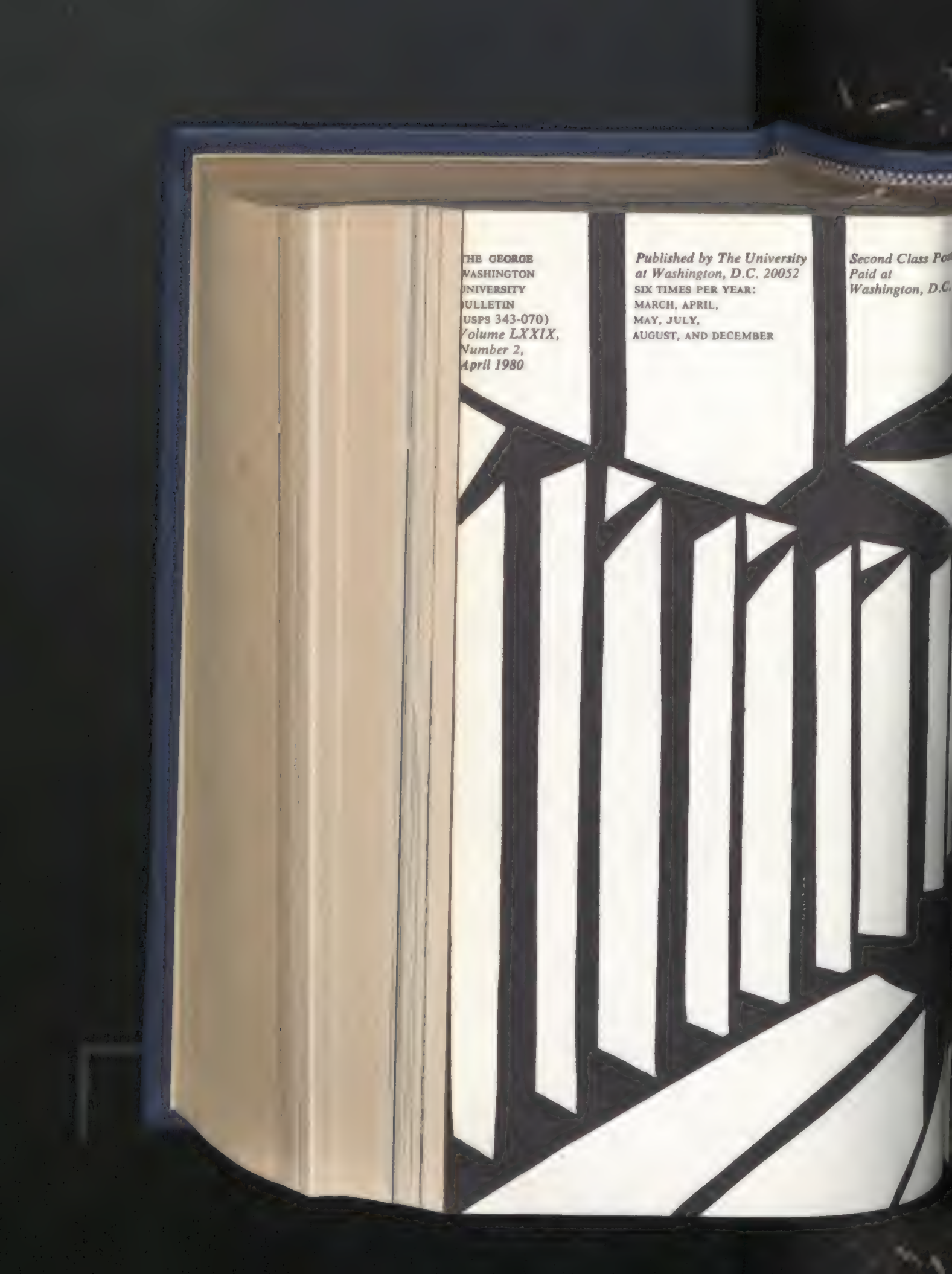


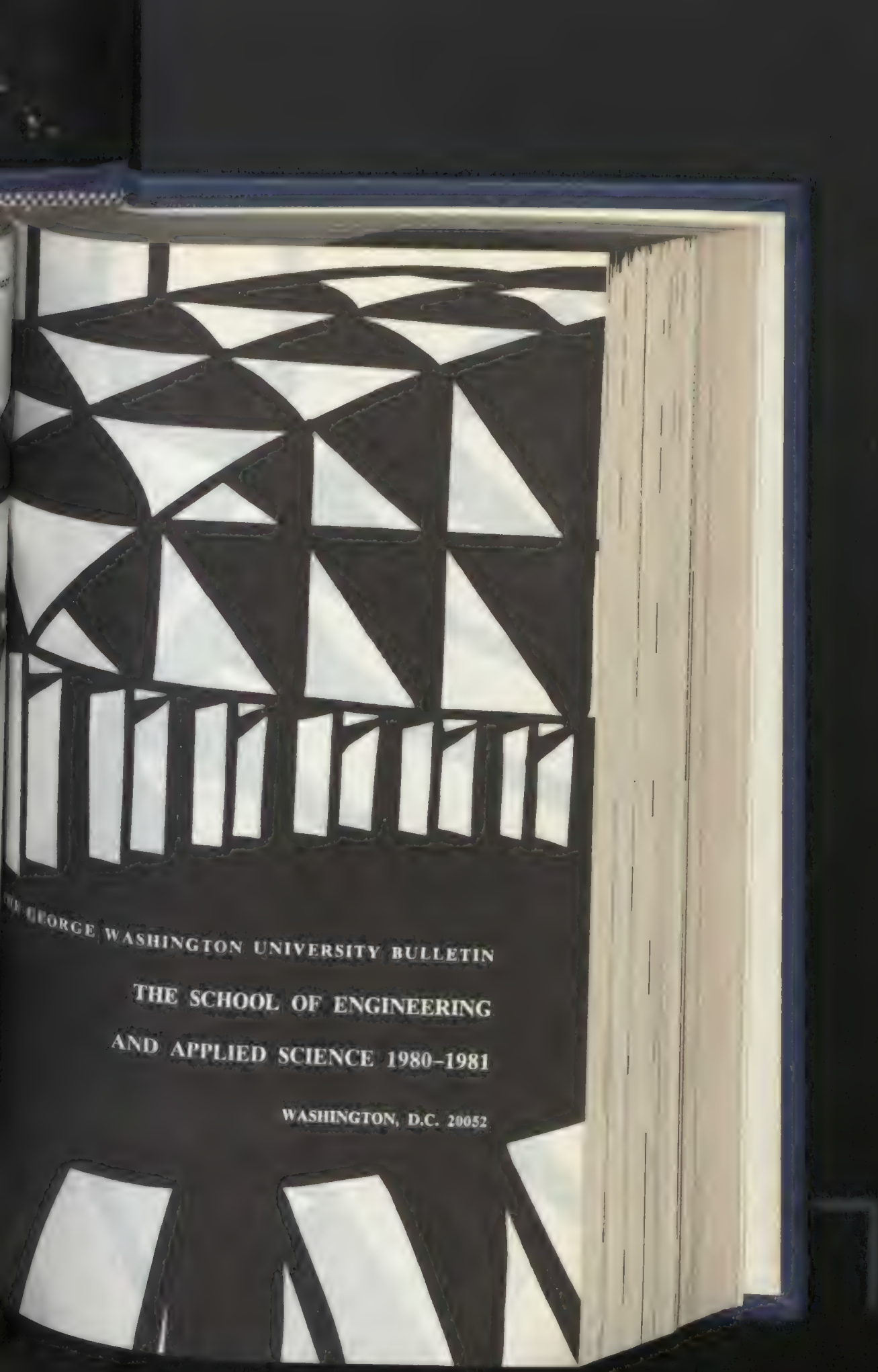

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XXIX, No. 2, April 1980
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AUGUST, AND DECEMBER

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GEORGE WASHINGTON UNIVERSITY BULLETIN

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1980–1981

WASHINGTON, D.C. 20052



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THE CALENDAR 19

1980 FALL SEMESTER

August 26-27	Advising for all students *Tuesday-Wednesday*
August 27	Orientation for new students from foreign *Wednesday*
August 28	Orientation and placement tests for all new uate students *Thursday*
†*August 28–30*	Registration—Tompkins Hall of Engineering *Saturday*
	Application for February graduation due as pa istration
September 1	Labor Day (holiday) *Monday*
September 2	Classes begin *Tuesday*
November 3	Application for spring semester financial aid due
November 17	D.Sc. dissertations of February candidates due
November 26	Thanksgiving recess begins after last class
December 1	Classes resume *Monday*
December 2	Last day of fall semester classes *Tuesday*
December 8–17	Examination period *Monday–Wednesday*

1981 SPRING SEMESTER

January 2	Master's theses of February candidates due *Friday*
January 5	Orientation for new students from foreign *Monday*
January 6–7	Orientation and placement tests for all new und ate students
	Advising for all students *Tuesday-Wednesday*
†*January 8–10*	Registration—Tompkins Hall of Engineering *Saturday*
	Application for May graduation due as part of tion
January 12	Spring semester classes begin *Monday*
January 20	Inauguration Day (holiday) *Tuesday*
February 2	Deadline for submission of 1981–82 freshman financial aid applications *Monday*
February 16	Winter Convocation (holiday) *Monday*
March 2	Deadline for submission of 1981–82 transfer undergraduate student financial aid D.Sc. dissertations of May candidates due *Monday*
March 7	Spring recess begins after last class *Saturday*
March 16	Classes resume *Monday*
April 1	Deadline for submission of Summer Sessions 82 graduate financial aid applications *Wednesday*
April 13	Master's theses of May candidates due *Monday*
April 17	Last day of spring semester classes *Friday*
April 23–May 2	Examination period *Thursday–Saturday*
May 3	Commencement *Sunday*

* This calendar is subject to change.
† The registration procedure and hours of registration will be stated in the *Schedule* which is available well in advance of each semester.

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TO ALL PROSPECTIVE STUDENTS:

The School of Engineering and Applied Science has been in continuous session since 1884, and offers programs of study leading to Bachelor's, Master's, Professional, and Doctor's degrees. Its prime objective is to develop in the student the precious asset of a well-trained mind which may be applied to the attainment of our many national objectives. In these changing times, it is necessary to search for quality. Students and faculty have the opportunity of assisting in the planning and implementation of educational programs. Examination is made periodically of the School's objectives and how they relate to those established by the Engineering Council for Professional Development (ECPD). Emphasis includes such items as the student's basic and advanced levels of education and role in present and future society.

This catalogue describes the programs and requirements for undergraduate and graduate study in the School of Engineering and Applied Science and includes information on the Engineering Honors Scholarships, Cooperative Education Program in Engineering, and the Joint Institute for Advancement of Flight Sciences (JIAFS).

The program of Engineering Honors Scholarships has been established to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of academic merit only and financial need is not a requirement for consideration.

The Cooperative Education Program in Engineering provides the undergraduate engineering student with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with practical, first-hand experience in the student's chosen field of engineering. The student's earnings will help to pay for a major part of the cost of an engineering education.

JIAFS was created by the joint efforts of the NASA-Langley Research Center and the School of Engineering and Applied Science. The education and research opportunities offered in the program combine the academic resources of George Washington University and the professional research resources and facilities of NASA-Langley Research Center to prepare qualified graduate students for careers in research, development, design, and teaching.

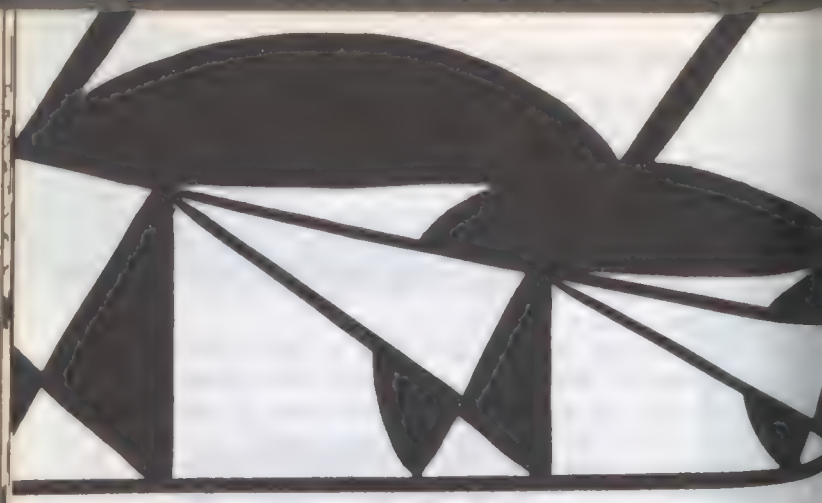
The School of Engineering and Applied Science is a professional school in a university comprised of eight degree-granting schools and colleges. The environment of the nation's capital is very favorable for the intellectual and cultural development of the student. The metropolitan Washington area contains the second largest concentration of research and development in the United States, and the engineering component of this activity is similarly extensive, offering many employment opportunities to students after graduation.

The atmosphere of the School is one of serious-minded effort toward mature development. Being a small school, it recognizes the individual as the single most important element in the educational process. The student body, undergraduate and graduate, has a primary interest in design, research, development, and management in both scientific and engineering activities. Many alumni of the School are successfully engaged in all fields of engineering—in science, management, government, and education.

The philosophy of the School, which might be summarized as "education for creativity, not conformity," has through the years reflected the many subtle and profound changes in the engineering profession.

The faculty of the School and I look forward to a closer and more fruitful relationship with you. If you need additional information, please do not hesitate to call upon the department chairmen or me.

HAROLD LIEBOWITZ
Dean



THE STUDY OF ENGINEERING

The Meaning of Engineering and Applied Science

The responsibilities and activities of the engineering profession ext
every aspect of industry and research and into many fields of comm
the arts. Engineers face problems in the production and distributi
types of manufactured products, including the design of mechanical, c
and chemical processes, of equipment, and of plants in which such proc
made; in the design and construction of a variety of structures such as
tunnels, harbors, and dams; in aircraft design and construction, includi
plicated electronic equipment for control, guidance, and communicatio
operation of transportation systems; in the automotive industry; in the
and space programs; in energy resources and power and in the generati
transmission of power; in modern communication; in traffic control; in ci
ning; in public health and sanitation as it affects the environment;
ventilation and refrigeration. This list of applications is far from exhau
does indicate, however, that engineering is a broad profession in wh
are many opportunities to specialize.

The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important
size the distinction between engineering and science. The President's S
Advisory Committee points out that the engineer and scientist ea
important role on a team: "The scientist is one who seeks to ex
boundaries of knowledge in his chosen field. The engineer has the
combining the knowledge of science with a knowledge and awareness
needs and limitations of human beings and of a human society to
and create things for human use. . . . While scientists have uncov
basic knowledge, it is the engineers who have created the tangible ass
rials, and products that have revolutionized our daily lives, our
living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge as a service to society, financial considerations, human resources, and society's needs are interrelated. The engineer is concerned, therefore, with the means for operating a dynamic society, and must consider not only whether the knowledge that exists will enable the creation of a workable product, but also how the product can be built, who will use it, and how such use will affect the environment in which it will operate.

The Professional Engineer

Engineers are concerned with the quality and preservation of human life. Engineer, as the term is used in this Bulletin and as it is commonly understood in our society, refers to the person who makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of purpose in serving as an intellectual agent in the practical world. This responsibility of the engineer arises from the breadth of the implications of engineering for the whole of society as well as from the depth of the requirements for competence. Technology has radically rearranged human life in our time. There are many who believe that, although the threshold of space has been crossed, the fusion of medical and engineering practice has been achieved, and breakthroughs have been made in other areas, this impact of engineering on modern life is just a modest preview of the engineering of tomorrow.

Engineering Education and the Student

The rapidly changing and progressing engineering activity requires an education for the future based on fundamental principles of science useful in applications in a dynamic, advanced society. In the fields of engineering and applied science there is no substitute for demonstrated ability and competence to solve the problems faced. Without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze and interpret all the aspects of a problem, to formulate solutions, and to evaluate those solutions in the light of all available information. To assure that the undergraduate education will enable students to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates and appraises the undergraduate program.

The curricula of the School of Engineering and Applied Science are founded on the basic principle of assisting the student in preparing for a career in engineering and applied science. This philosophy requires that the student master the principles on which future practice will be based. An education centered on that meaningful junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, science, history, government, and other disciplines, requires scholars. But in any of these areas the prospective student who has not

achieved high scholastic standing can find a place, if the student has ... interest in the subject. The average student who is interested and wi... work will find in engineering and applied science a rich and varied fi... study which can lead to satisfaction and success. It is difficult to make ge... izations in this area, but students who have demonstrated an aptitude ... mathematics, science, and English will probably find the work of engineer... the study of engineering and applied science satisfying and challenging ... nate intellectual curiosity and the desire to learn and to work hard are ... indicators of success. College Board examinations may reveal the capa... undertake further study in mathematics and science and their applicat... engineering. No school or college can "give" an education. It can offer ... the opportunity to "get" an education. The George Washington Univers... School of Engineering and Applied Science is a small school which pro... an opportunity for close contact with faculty members, as well as the ... tunity to participate in student organizations, and in many other studen... tivities. The School recognizes the individual as the most important elemen... the educational process.



THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

History

The School of Engineering and Applied Science was organized October 1, 1884, as the Corcoran Scientific School of Columbian University and was situated in the University Building then at 15th and H Streets, N.W. The School was named in honor of William W. Corcoran, Trustee and President of the Corporation from 1869 to 1888. Day and evening courses were offered in literature, science, and technology and led to the degrees of Bachelor of Science, Civil Engineer, Mechanical Engineer, and Mining Engineer. The School was among the first to accept women for degree candidacy in engineering.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and the Columbian College were merged into a single Department of Arts and Sciences. Graduate engineering degrees were offered.

Administrative changes led to The Washington College of Engineering being situated in 1905 as one of the several semi-independent undergraduate colleges of the University, each with its own Board of Trustees. The College provided instruction leading to undergraduate degrees in engineering and architecture.

In 1909 the name of the College was changed to the College of Engineering and Mechanic Arts, and the curricula were revised to give the student a thorough understanding of the theory underlying engineering practice. Emphasis was placed on the development of a knowledge of scientific principles upon which the student could build and by which he might solve new problems as they are met in practice.

The name of the School was changed again in 1914 to the College of Engineering and later to the School of Engineering. Architecture was dropped from the curriculum, and degrees were limited to the field of engineering. However, the primary emphasis upon principles rather than technology which had characterized the School since 1903 was continued and has remained to this day as one of the important distinguishing features of the School.

In 1962 the name of the School became the School of Engineering and Applied Science.

Academic Status

The George Washington University is accredited by its regional acc
agency, the Middle States Association of Colleges and Secondary Scho

The University is on the approved list of the American Association
versity Women and is a member of the College Entrance Examination

The undergraduate curricula in Civil Engineering, Electrical Engi
and Mechanical Engineering are accredited by the Engineers' Council
fessional Development.

University Policy on Equal Opportunity

In accordance with the stated policy of its Board of Trustees and
formity with federal laws and regulations, The George Washington U
sity does not discriminate against any person on the basis of sex, race,
religion, national origin, or handicap in any of its educational programs
tivities. Federal regulations implementing Title IX of the Educational Am
ments of 1972 and Section 504 of the Rehabilitation Act of 1973 call
explicit statement that the requirement not to discriminate on the basis
or handicap extends to employment in and admission to such programs
tivities. The University is also subject to the District of Columbia Hu
Rights Law.

Inquiries concerning the application of this policy and federal law
regulations concerning discrimination in education or employment prog
and activities may be addressed to Marianne Phelps, Assistant Provost
firmative Action, Rice Hall, Washington, D.C. 20052, or to the Director
Office of Civil Rights of the Department of Health, Education, and W

Undergraduate Study

The undergraduate program is intended to provide a solid foundation
basic principles, concepts, and techniques underlying engineering and a
science, on which the individual may build technical competence in a
of areas as his professional career develops. It is preparation for a
engineering or applied science, as it exists today and as it may develop
future.

Undergraduate study is the formal beginning of a lifelong continuing
gram of education. The School provides an environment that fosters
tudes and disciplines essential to professional growth. Graduates, who
receive the bachelor's degree, are prepared for productive work in the
field and for further development and progress, both formal and info
The undergraduate curricula include courses in the humanities and soci
ences to the extent necessary to develop a reasonable understanding
preciation of these areas of knowledge.

Admission to the engineering program indicates that the student poss
at least minimum preparation and the probable capacity to meet the acad
demands of this School. Since the School cannot predict either the
response to the academic demands or the program to follow for the
effective development, the undergraduate program has been designed to
a variety of experiences through which the student may find the best
educational growth and maturity.

The School is a place for learning; for experiencing adventures of the mind and of the hands; for the formulation, exchange, and exploration of ideas. During the undergraduate years the student is led to strengthen skills in analysis and talent for creative activity, through liberal use of project-type laboratory work. Independent thought and original ideas receive higher evaluation, in the appraisal of student achievements, than the rote recital of information.

To provide the undergraduate engineering student with the opportunity to obtain an enduring foundation in engineering education by combining academic learning with relevant, real-world employment which provides practical, first-hand experience in engineering, the School of Engineering and Applied Science has a Cooperative Education Program in Engineering in which arrangements have been made with leading industrial and governmental organizations for student employment at prevailing salary rates. Every effort is made to place the student in positions of employment that provide the best possible engineering experience consistent with career plans. These work periods provide the student with income that may be used to finance the major portion of tuition and other expenses. Entering freshmen, as well as transfer students from community colleges whose completed work is equivalent to requirements in this program, can be admitted to the Cooperative Education Program in Engineering.

ADMISSION TO UNDERGRADUATE STUDY

The School admits those applicants who can benefit themselves and society by disciplined intellectual effort in its environment. In the selection process, there is no discrimination because of sex, race, color, religion, national origin, or handicap.

Admission is the first selective step in a long series of qualifying steps the student will take in his progress toward professional competence in engineering. It indicates the School's belief that the applicant has at least the minimum preparation and ability to complete the curriculum successfully.

The applicant must be of good character and must have an academic background appropriate for the program of studies contemplated.

Application for Admission

An applicant for admission obtains from the Office of Admissions of the University or from the School of Engineering and Applied Science an application blank which must be filled out completely and returned with the $15* application fee.

Students From U.S. Institutions

Records presented become the property of the University and *cannot* be returned.

*The application fee must be by check or postal money order, payable to George Washington University. The application fee is waived for a student applying for readmission who was registered in the degree program at the time of the student's last registration at this University and who has not since registered at another institution.

INCOMING FRESHMEN

Consideration for admission is based on the following: (1) an accep
tificate of graduation from an accredited high school showing a
units*; (2) scores on two College Entrance Examination Board
Scholastic Aptitude Test (SAT) and the English Composition Ach
Test; or on the American College Test (ACT), and the English Co
Achievement Test.

The principal's statement that the applicant is prepared to undertak
work may also be requested by the University.

The qualifications of applicants who, because of unusual circumsta
not meet the above requirements will be considered by the School, wh
prescribe admission tests.

Nine and one-half of the 15 units required for entrance must be
uted as follows: three in English, two in algebra, one in plane geomet
half in plane trigonometry, one in physics or chemistry, and two in hi
one foreign language. General science may *not* be counted in satisfactio
science requirement but may be counted as an elective unit. It is recom
that *both* physics and chemistry be studied in high school.

An applicant must arrange to have sent directly *from his school to t
of Admissions of the University* the secondary school academic record
information may be stated on a form supplied by the University or on
ard form used by the secondary school, provided that all essential info
is included.

Quantitative Deficiency—A graduate of an approved high school wh
not more than two units of the required subjects and who presents 15
able units may be admitted to a prescribed program which includes co
make up the deficiencies.

Applicants who wish to begin study in the fall semester should fo
plans early in the high school senior year. Although the University p
have applications submitted during the fall semester of the high scho
year, applications may be submitted until August 1. However, students
to be considered for financial aid should have their applications and
quired documents submitted by February 1. Students graduating at
wishing to begin study in the spring semester *should* apply no later tha
cember 15. Applications and all required credentials of students w
begin study in either the first or second term of the summer session
received prior to April 15.

Although decisions on most applications for the fall semester will req
mission of seventh-term grades and senior-year test scores, an earlier
will be given after September 1 to a student whose application becom
plete with a secondary school record through the junior year and
test scores, provided these records clearly establish admissibility.

TRANSFER STUDENTS

Transfer students from other institutions (see page 24 for minimum resi
requirement) should submit all applications and required credentials pr

* A unit represents a year's study in a secondary school subject, including in the average
than 120 sixty-minute periods of prepared classroom work.

August 1 for the fall semester, December 1 for the spring semester, April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been suspended more than one time or academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher learning must request *each registrar* to mail directly *to the Office of Admissions of the University* a transcript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (*C* or better in academic courses from an accredited institution), at the time the application is submitted, the applicant must request that the high school record and College Examination Board SAT or ACT test scores be sent to the Office of Admissions.

If high school units are not shown on the college transcript, the applicant must request that the high school record be sent to the Office of Admissions.

Students from Foreign Institutions

The application, required records, and scores on the Test of English as a Foreign Language (TOEFL) (see below) or American Language Institute Georgetown University test (ALIGU) must be received from *all international applicants* no later than June 1 for the fall semester, November 15 for the spring semester, and April 15 for the summer sessions.

REQUIRED RECORDS

At the time the application is sent, the applicant must request the educational institution previously attended to send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned. These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

Consideration will be given to academic documents delivered by the student if circumstances prohibit the receipt of official records.

LANGUAGE TEST

Students whose native tongue is not English are required to take the TOEFL test (Test of English as a Foreign Language) or the ALIGU test (American Language Institute, Georgetown University). Students are responsible for making arrangements for taking these tests. Foreign students abroad should consult with the nearest U.S. Embassy for information on arrangements for taking ALIGU. Those interested in TOEFL should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score

sent to three different institutions. Registration for either the TOE
ALIGU test does not constitute application for admission to Geo
ington University.

The TOEFL *Bulletin of Information*, obtainable without charge,
description of the test as well as rules regarding application, fees, re
the conduct of the test, lists of examination centers, examination dat
application blank. On the application for the Test, the student shou
that the scores be sent to the appropriate admissions office at this
(see "Admission to Undergraduate Study," pages 13–15, or "Graduat
sion Procedure," pages 27–28).

In addition to the TOEFL or ALIGU tests, an admitted student m
quired to take a test in English as a Second Language prior to registrat
sults of this test will determine the courses the student will be permitte
ister for in the program of study. If the knowledge of English is inad
enable the student to undertake any academic work, the student will no
mitted to register for any courses other than English and will be req
study English on a full-time basis. Students in this category should
expect to take a longer period of time to complete their graduation
ments than students who are not obliged to complete the additional
courses.

International students in the United States may take a locally admi
George Washington University English placement test in lieu of the Al
TOEFL test. A $10 fee is charged for this examination. Arrangements
test may be made by contacting:

Dr. George R. Bozzini, Director
English for International Students
George Washington University
Washington, D.C. 20052

FINANCIAL CERTIFICATE

If a student plans to enter or remain in the United States to study
University and the visa status will be either student (F) or exchange
(J), a Form I-20 or DSP-66 cannot be issued until the student has be
mitted to the University and has completed the Financial Certificate
factorily. The Financial Certificate is a document which may be obt
from the School of Engineering and Applied Science. It requests infor
about the resources (money) available to the student to support his/he
tional and living expenses while in the United States. The Certificate sho
accompanied by supporting documents such as bank statements or letters
governments authorizing scholarship awards.

SPECIAL ENGLISH COURSES FOR INTERNATIONAL STUDENTS

The extensive experience of the Department of English with the language
of international students has been synthesized into a comprehensive E
Language Program that includes the following courses:

NGLISH AS A FOREIGN LANGUAGE

20 Intensive Basic English (0)

Meets 20 hours per week. The objectives of the course are to strengthen the ability to use basic grammatical structures appropriately and to introduce increasingly complex structures; to build reading skills and to enlarge vocabulary through the use of specially adapted materials; to introduce the student to unadapted reading materials, such as newspapers; to focus on writing sentences; to familiarize the student with the cultures of the English-speaking peoples; and to foster multicultural sharing among international students. No academic credit. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

30 Intensive Lower-Intermediate English (0)

Meets 20 hours per week. The objectives of the course are to increase the ability to use complex grammatical structures; to develop writing ability through the paragraph level and to improve reading skills; to enlarge vocabulary further and to encourage oral expression through practical conversation and laboratory exercises. No academic credit. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

40 Intensive Higher-Intermediate English (0)

Meets 20 hours per week. The objectives of the course are to provide a comprehensive review of grammatical structure, including clauses; to expand vocabulary further through use of unadapted reading material; to increase reading speed and comprehension; to encourage oral expression of ideas encountered in the student's reading material. The course also includes instruction in composition which focuses on outlining and techniques of exposition. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

45 Semi-Intensive Higher-Intermediate English (0)

Meets 10 hours per week. The objectives of the course are the same as for EFL 40. Students enrolled in EFL 45 may—with the authorization of the Admissions office of the school to which they are applying—take one undergraduate or graduate course concurrently with English. Tuition is charged at the rate of 5 semester hours.

50 Advanced English (3)

Meets 4 hours per week. An advanced-level composition course for students showing a high degree of academic proficiency in English. The aim of the course is to develop writing skills and to foster an understanding of technical writing. The course requires a writing assignment each week and a 10–20-page research paper. For the latter project, the student is introduced to library research methods. The course meets 4 class hours per week and also involves extensive individual counseling outside the classroom. Laboratory fee, $25.00.

The language laboratory is available to all students in the English L Program. The laboratory contains a library of tapes that accompany the texts and a variety of listening and recording equipment, including inc recording and playback equipment.

Admission to a particular English class is determined by a suitable objective and nonobjective tests.

The English Language Program is administered by the College of Studies and is offered in cooperation with the Department of English, Pr J.P. Reesing, Jr., Chairman. The English for International Students Prog under the direction of Dr. George R. Bozzini.

PROVISIONAL REGISTRATION OF INTERNATIONAL STUDENTS

Outstanding international students who do not meet the minimum test for the TOEFL or ALIGU may be admitted to the School on a "provis basis. This "provisional" admission requires the student to take an "E only" program until an improved English capability permits the stude take technical courses. After satisfactory completion of English langua quirements, such students will be granted full admission status.

READMISSION

A student previously registered in the University who was not registered campus during the immediately preceding semester (summer session excl must apply for readmission. Final dates for applying are the same as those undergraduate admission (see page 13), or graduate admission (see page If the student applies as a degree candidate and was previously registered nondegree student, or if a student has attended one or more higher insti while absent from the University, the student must have complete, o transcripts sent to the appropriate office at this University from each institu attended. Applications for readmission are considered on the basis of the tions currently in effect.

The application fee is waived for a student applying for readmission was a degree candidate at the time the student last registered at this Uni sity and who has not since registered at another institution.

ADVANCED TUITION DEPOSIT

After notification of acceptance, a $100 advanced tuition deposit will be quired of all full-time undergraduate students including those readmitted deposit is due on May 1 or within 21 days of the date of notification mission if after May 1 for students entering the fall semester, and Dece 15 or within 21 days of notification if after December 15 for students ing in the spring semester. The deposit is credited toward tuition and refundable.

Advanced Standing

CREDIT BY EXAMINATION

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned toward partial fulfillment of the engineering core curriculum upon admission to the University for each or any combination of the following:

College Entrance Examination Board Advanced Placement Tests (APT)—Credit is assigned for examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Examinations passed with scores of 3 will be considered for credit or placement if the student arranges to have the examination paper sent to the Office of Admissions. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1025, Berkeley, Calif. 94701.

College Entrance Examination Board College-Level Examination Program (CLEP)—CLEP offers two types of examinations: general and subject. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 47 subjects.

New Students—Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate credit for the General Examinations in the social sciences (six credit hours) and humanities (six credit hours) passed at the 50th percentile or above (college sophomore norms); such credit is assigned in partial fulfillment of the 18 credit hours required in the humanities and social sciences. Credit is not assigned against the engineering curriculum for CLEP General Examinations passed in the areas of mathematics, natural sciences, or English composition.

Credit is assigned for the CLEP Subject Examinations which are applicable to the School's curricula and which are passed at the level recommended in the College Board model policy.

Registered Students—A candidate for a degree (*i.e.*, a student already registered at the University before taking the CLEP Examinations) must seek departmental approval prior to taking the CLEP Examination for credit. Credit may not be earned by passing the Examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the Examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, New Jersey 08540.

Department Examinations for Waiver or Credit—Registered SEAS students may also take examinations in some departments for waiver of, or credit for, specific course (see Fees, p. 206) upon approval of the appropriate department chairman; the student must demonstrate sufficient preparation. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

MAKEUP OF CREDIT FOR WAIVED COURSES

If a mathematics or natural science course required by the enginee riculum is waived, the corresponding credit hours must be earned by sa completion of a university-level course, either technical or non-technic is approved by the student's Department Chairman.

WAIVER OF THE ENGLISH COURSE REQUIREMENT

A waiver of the English course requirement in the core curriculum will ed to those who achieve a score of 650 or higher on the English Com Achievement Test of the College Entrance Examination Board.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work or e tion, advanced standing may be granted for work successfully comp accredited institutions of higher learning. Credit will be granted only wh work meets the requirements for the degree sought at this University a be accepted provisionally. Work of low caliber (*D* or the equivalent) be considered for transfer.

Although there is no strict limit to the total amount of transfer cre may be assigned, a student must satisfy the residence and course requir for the degree sought at George Washington University.

CREDIT FROM TECHNICAL INSTITUTES

Advanced standing may be granted for work successfully completed at cal institutes. Credit will be granted for transferred work only when the cant passes successfully the required validation examination. Arrangem the examination should be made with the appropriate department of the Normally, no more than 30 semester hours of credit for technical wo be granted in transfer for those who graduated from a two-year techn tute. A maximum of 60 semester hours of credit for technical work granted in transfer for those who graduated from a four-year technical in

CREDIT FROM SERVICE SCHOOLS

A limited amount of credit may be assigned for selected service school tion received since 1941. No more than 30 semester hours may be assig a combination of service schools and examinations referred to above. should submit to the Office of Admissions photostatic copies of their school records, indicating courses successfully completed with sufficient cation of the course to locate it in the *Guide to Evaluation of Educational perience in the Armed Forces.*

CREDIT FROM BALTIMORE POLYTECHNIC INSTITUTE

Credit will be assigned to Baltimore Polytechnic Institute "A" course ates who have earned scores of 80 or above in the applicable courses

lent to the following engineering core curriculum courses: Math 31, 32; Phys 3, 15; Chem 13; Eng 4; EE 51.

REGULATIONS

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 205–10; other University regulations, on pages 216–20.*

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular attendance is required. Students may be dropped from any course for undue absence.

Students are expected to attend every meeting of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, and all absences must be excused before provision will be made for them to make up the work missed. Excuses for absences from examinations which have been announced in advance can be obtained only by written application to the instructor in charge of the course.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 20 semester hours. A student employed more than 24 hours a week who is not on probation may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the Dean's permission.

Advisory System

The School of Engineering and Applied Science encourages a close faculty-student relationship. Every entering undergraduate student is assigned a permanent faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, the achievement and maintenance of satisfactory scholastic performances, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, students must consult with their adviser in all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the Dean, Associate Dean, Department Chairman, and adviser concerning any student problems.

Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final reponsibility for a student's action lies with the student.

Scholarship

For scholarship requirements for graduation, see "Graduation Requir
page 24.

Grades—Grades are mailed to the student through the Office of th
trar at the close of each semester. They are not given out by instructo

The following grading system is used: *A*, Excellent; *B*, Good; *C*
tory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authori
drawal; *Z*, Failure, Unauthorized Withdrawal. The symbol *I* indicates
satisfactory explanation has been given the instructor for the student's
to complete the required work of the course.

At the option of the instructor, the grade of *I* may be recorded if a
for reasons beyond his control, is unable to complete the work of the co
if the instructor is informed of and approves such reasons before the d
grades must be reported. The grade may be used only if the student's
formance and class attendance in the course have been satisfactory. A
to complete the work of a course which is not satisfactorily explained to
structor before the date when grades must be turned in will be graded
ceptable reasons are later presented to the instructor, that instructor ma
an appropriate grade change. Although the grade of *I* may remain on
ords for a maximum of one year, the instructor should normally set
briefer period within which the uncompleted work (usually the final exa
tion or required paper) must be made up. The grade of *I* cannot be
by the student's reregistering for the course here or taking its equivalen
where. An *I* cannot be made up after the lapse of one calendar year.

Quality-point Index—Scholarship is stated in terms of the quality-p
dex. The index is obtained by dividing the student's total number of
points by the total number of semester hours for which the student re

Quality points are computed from grades as follows: Each grade h
a numerical equivalent: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points
points; *F*, no points. The quality points for a course are obtained by m
the credit hours of the course by the numerical equivalent of the
achieved. Courses marked *W* or *I* are not considered in determining the
Courses marked *I* will be included once the *I* is converted to a regu
grade. Grades in courses taken at other institutions are not considered
puting the quality-point index, with the exception of courses taken at
the Consortium universities (see pages 205 and 221).

Mid-semester Warning—At the end of the seventh week of each
instructors report to the Dean the names of students whose scholarship
satisfactory. On receipt of a warning notice, students must consult with
propriate instructor and their adviser immediately. The adviser may pr
diagnostic tests and/or remedial study to be completed before the end
current semester.

Probation—A full-time student (one taking 12 semester hours or
whose quality-point index based on all courses attempted in his most
semester falls below 2.00 for that semester, or who receives two grades
of *F* in one semester, will be placed on probation. A student enrolled
than 12 semester hours during the fall or spring semester and a student
during the summer sessions is subject to probation or suspension on
of the student's record for the most recent 12 semester hours, rather

he record in any one semester. The probation period is for one semester for ull-time students, or the next 12 semester hours of study for part-time students. To be removed from probational status, a student must earn a quality-point dex of at least 2.00 in all courses taken during the period of probation and ceive no grade of *F* during this period.

A student who fails to achieve a quality-point index of 2.00 for all courses mpleted during the probation period is continued on probation for an addi- onal period of one semester or 12 semester hours of study.

Upon being placed on probation, a student may be required to undertake the ngineering Student Probation Program of testing, counseling, and remedial ork available at the Counseling Center. Students on probation are required follow a program of study prescribed by the adviser and Department Chair- an, and are cautioned not to take more than 12 semester hours of study. uch students are not eligible to participate in student activities.

Suspension—The following cases constitute grounds for suspension: (1) o or more grades of *F* received during a probation period; (2) failure to hieve a quality-point index of 2.00 in a second consecutive period of pro- ion; (3) failure of a student who has been on probation for three periods to hieve a quality-point index of 2.00 in the third period or any subsequent mester.

Dean's Honors List—The Faculty of the School recognizes meritorious scho- ic achievement by a Dean's Honors List, containing the names of candidates undergraduate degrees whose scholastic achievement satisfies all of the fol- ing requirements:

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.00 or higher and with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken with respect to the student.

he Dean's Honors List is prepared at the end of the fall and spring semes- and displayed in an appropriate public place in the School. A notation is e on the student's record each time his name is included in the List.

of Correct English

student whose written or spoken English in any course is unsatisfactory be reported by the instructor to the Associate Dean. The Associate Dean assign supplementary work, without academic credit, varying in amount the needs of the student. If the work prescribed is equivalent to a course, egular tuition fee is charged. The granting of a degree may be delayed for re to make up any such deficiency in English to the satisfaction of the ciate Dean.

duation Requirements

ages 218–19 for general requirements for graduation.

RESIDENCE

A minimum of 30 semester hours must be completed in residence. Se
work may be counted. Unless special permission is granted by the D
study elsewhere, the work of the final year must be completed in resi

SCHOLARSHIP

To be eligible for graduation a student must have (a) a quality-point inde
least 2.20 in those technical courses specified in the fifth through the
semester of the curriculum, and (b) a 2.00 overall average.

HONORS

With Distinction—A bachelor's degree may be conferred "With D
tion," at the discretion of the Faculty, if a student attains a quality-point
of 3.50 or higher on all work taken at this institution. To be eligible fo
honor, a student must have completed at this institution at least one-ha
work required for the degree and must petition the Department Chair
later than the beginning of the student's final semester.

Special Honors—A bachelor's degree may be conferred with "Specia
ors," at the discretion of the Faculty, for outstanding achievement in
dent's senior year work on recommendation of the Faculty, under the follo
regulations:

1. The student must have candidacy for Special Honors approved by t
partment chairman representing the major field not later than the beginn
the senior year.

2. The student must meet such other conditions as may be set at the
candidacy is approved.

3. No student will be awarded Special Honors unless a quality-point
of at least 3.00 is achieved on all work taken at this institution.

4. To be eligible for Special Honors a student must have complete
institution at least one-half of the work required for the degree.

UNDERGRADUATE CURRICULA

The four-year undergraduate curricula lead to the degree of Bachelor of Sc
with parenthetic designation of the major; for example, Bachelor of Sc
(Electrical Engineering). Students who are deficient in preparation requ
longer period; those who are admitted with advanced standing or who
summer sessions can complete the requirements in less time.

The program of the first four semesters, with minor exceptions, is
mon to all curricula and provides the essential broad base of scientific
ciples and mathematical techniques necessary for the professional cou
the last four semesters, together with an appropriate background in
humanities and social sciences (see below).

A minimum total of 130 semester hours is required to qualify for the
gree. Certain options may require more than the minimum. However,
dents are encouraged to elect additional course work above the required
mum to the extent that their interests and the School's offerings permit.

Degrees are offered in Civil Engineering, Electrical Engineering, and Mechanical Engineering. Students in Civil Engineering may select options in Computer-oriented, Environmental-oriented, and Geotechnical Civil Engineering; students in Mechanical Engineering may select options in Computer-oriented Mechanical Engineering and in Energy-oriented Mechanical Engineering. Electrical Engineering provides options in Computer Science and Premedical Engineering.

The student is assisted by a faculty adviser, who approves the program each semester prior to registration. For the guidance of the student and the adviser, every beginning freshman takes the placement examinations in English and mathematics. A student who is deficient in mathematics may be required to take remedial work. Results on the English placement test determine the level of the English course the student will take.

Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students assists them in acquiring knowledge which will permit an understanding of the social and humanistic elements of the past and present and an analysis of problems facing society today. The ultimate goal is to help the engineer have a better understanding of society and an appreciation of the engineer's role and responsibilities within it.

Since the education of an engineering student is, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should not emphasize technical aspects and skills, but should rather consist of courses which broaden the outlook. As a consequence, courses in subjects such as accounting, finance, industrial management, introductory languages, and personnel administration should not be included in the humanities and social sciences program. On the other hand, courses in areas such as anthropology, economics, fine arts, geography, history, literature, philosophy, political science, psychology, and sociology are considered appropriate.

Engineering students are required to prepare, with the assistance of their faculty adviser, a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours and must be approved both the adviser and Department Chairman.

Modern Laboratory Facilities and Research Opportunities

Laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged to supplement each other. The learning experience is made more meaningful when coupled with research activities. Students may involve themselves in the various kinds of research activities in progress at SEAS. Research is being conducted in structural mechanics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

SEAS provides a wide variety of computing facilities for student and faculty use. Located on the fourth floor of Tompkins Hall, the SEAS Computing Fa-

cility includes an HP 3000 computing system with 12 time-shared in CRT terminals and remote telephone access; 14 Apple microcompu based computer systems; a VAX 11-780 computing system, primarily for color and black and white computer graphics research; and a labora instruction in microprocessor software and hardware development.

A wide variety of high-level languages, as well as machine and a languages, are supported. The Facility provides technical and operati sistance to all users during normal operating hours: 9 a.m.-11:30 p.m. Friday, 12 noon-6 p.m. on weekends.

Additional computing facilities, not under the purview of the SEAS puting Facility, are available to students and faculty at the Center for and Administrative Computing (see page 221) and throughout the specialized laboratories in SEAS.

The varied laboratory facilities available to complement classroo and conduct research also include an MTS random-cycle fatigue testing a fully instrumented wind tunnel; a combined water tunnel and circulating channel; a water pollution laboratory; an air pollution laboratory; a foundation engineering laboratory; electrical engineering laboratory with scopes, signal generators, digital multimeters, power supplies, and re lated equipment; microprocessor laboratory with modern microcomputer (Imsai Z80); digital computer laboratory with modern microcomputer (6800 Microprocessors); a materials science and engineering laboratory electron scanning microscope; a thermal science laboratory; and gen chanical engineering and applied mechanics laboratories. Arrangements be made for use of special equipment at various government laboratories as the Naval Research Laboratory, the National Bureau of Standards, National Aeronautics and Space Administration.



Graduate Study

The School of Engineering and Applied Science offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science, and to the Professional degrees of Engineer and Applied Scientist.

In its graduate programs, the School, as it does in undergraduate study, adheres to the educational philosophy of increasing the knowledge and understanding of the individual student by concentration on principles and their application rather than by encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the "Programs of Study and Courses of Instruction" section of this catalogue beginning on page 52.

MASTER'S DEGREE PROGRAMS

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to 6 semester hours). With the approval of the department the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required. Upon admission the student is assigned an adviser. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the appropriate department chairman.

Admission

Admission to graduate study toward a Master's degree requires an appropriate Bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, such as may be indicated by undergraduate records, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses be taken fulfill any part of the requirements for the Master's degree.

For additional admissions requirements for the degrees of Master neering Administration and Master of Science in the Department of ing Administration, see pages 169 and 173; for the degree of Master in the Department of Operations Research, see page 190. Candidates fo gree of Master of Science in the Department of Electrical Enginee Computer Science must have satisfied specific undergraduate requi depending upon the area of concentration.

ADMISSION PROCEDURE

Admission application forms are available at the School of Enginee Applied Science. They must be submitted, together with the nonre application fee of $25, to the Manager of Engineering Admissions, Ro Tompkins Hall of Engineering, George Washington University, Wash D.C. 20052, no later than August 1 for the fall semester, December the spring semester, May 1 for the first summer session, June 1 for the summer session, and July 1 for the third summer session. The applica request each educational institution attended since high school gradu send an official transcript of the student's record directly to the Ma Engineering Admissions. Although not required, the applicant who has pleted the Graduate Record Examination should request that the sco sent to the School. The applicant will be notified by mail when a dec admission has been made. English language and other pertinent requi for international students are outlined on pages 15–18.

All inquiries and correspondence relative to graduate admission sh directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B* normally must have been earned in a graduate program at another re institution, *may* be accepted in transfer, when applicable, to satisfy t degree requirements in this School. However, students must, with the ap of their adviser, petition to the appropriate Department chairman for transfer.

Registration

A graduate student may register for classes upon presentation of an letter of admission or a Student Identification Card from the previous s No registration is accepted for less than a semester or one summer sess

Concurrent registration in this School and in another institution ne ber of the Consortium of Universities of the Washington Metropolita Inc., or another division of this University requires the written permis the Deans concerned, *prior to registration*. Allowance of credit for work concurrently at another institution is at the discretion of the Dean

Dates and hours of registration are stated in the Calendar, page 2 the *Schedule of Classes* published in advance of each semester.

Master's Thesis

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course 299, the candidate must submit the thesis area to the appropriate department chairman, on the form obtained from the School office and approved by the faculty adviser. The candidate must submit the thesis title to the Dean, on the form available in the School office, at the beginning of the semester of expected graduation. Registration in thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. Students may consult their adviser, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student will be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis 300 and pay tuition as for a repeated course. The overall time limit for earning the degree (see page 31) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Optional Master's Program without a Thesis

With the approval of the appropriate department, a student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This Examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the Examination satisfactorily, the student's graduate status terminates.

Regulations

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 205–10; other University regulations, on pages 216–20.*

ATTENDANCE

Students may not attend classes until registration is completed and fees are paid or appropriate arrangements are made with the Office of Student Aid. They may attend only those classes for which they are registered. Students are expected to attend every meeting of the course in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

SCHOLARSHIP

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Failure; *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal.

Students who receive two grades of *F*, or three grades below *B*, are barred from further enrollment in graduate courses and, ordinarily, will not be admitted to graduate study.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of a course, and if the instructor is informed of and approves such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade *I* may remain on the records for a maximum of one year, the instructor will normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete which is not removed within one calendar year is automatically changed to an *F*.

A student may not repeat for credit a course in which the student has received a grade of *C* or above, unless required to do so by the department concerned. A written statement requiring the student to repeat such a course for credit must be submitted to the Registrar by the appropriate department chairman.

Pass-No Pass Grading System—SEAS students may take SEAS courses under the pass/no pass grading system, but credit for such courses cannot be applied toward any degree program in SEAS.

GRADUATION REQUIREMENTS

Thesis—In addition to 6 credit hours of acceptable thesis, a student must graduate with either:

1. 24 credit hours of *B* or better with no more than two grades below *B*, of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 24 credit hours with no more than two grades below *B* of which only one *F* is permitted.

Non-thesis Option—A student may graduate with either:

1. 33 credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 33 credit hours with no more than two grades below *B* of which only one *F* is permitted.

Quality-point Index—Scholastic standing is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points; *F*, no points, for each semester hour for which the student registered. Courses marked *W* or *I* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done in residence on the campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the Master's degree program under whatever conditions and regulations are in effect at that time.

TIME LIMITS

A full-time student in the Master's program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first graduate-student status registration in prerequisite or graduate courses. A part-time student in the Master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman and approved by the Dean.

PROFESSIONAL DEGREE PROGRAM

The School of Engineering and Applied Science has established the Professional degree program to provide an educational program for those students who are

interested in pursuing course work beyond the Master's degree, with on applied subject material rather than on basic research.

Successful completion of the Professional degree program leads to t of Engineer or degree of Applied Scientist.

In the Professional degree program, the School adheres to the ed philosophy of increasing the knowledge and understanding of the indi concentration on principles and their application. This approach shoul the students with a technical flexibility to enable them to adapt succe rapidly changing technology. Each program is individually planned to the student's background and needs and is subject to departmental ments.

The Professional degree program has been designed to satisfy the industry and government for highly trained and educated technical per engineering and applied science.

Professional Degree Study Programs

The Professional degree program provides graduate study in those engineering or applied science in which the School has adequate fac resources. Upon approval, the student may select courses in other dep of instruction in the University to serve specific needs or objectives.

The student's program may provide for broad coverage in a variety or may be designed to provide a concentration in particular areas. Th mum program consists of 30 semester hours of approved graduate cou yond a Master's degree. Students whose graduate study does not includ sary prerequisites may be required to take more than the minimum hours required.

Admission

Admission to graduate study toward the Professional degree requires priate Master's degree from a recognized institution and evidence of capa productive work in the field selected as indicated by prior scholarsh where appropriate, professional experience.

REQUIREMENTS

1. *Engineer*—To study toward the degree of Engineer, an applic possess a Master's degree and a bachelor's degree in an area of engin

2. *Applied Scientist*—To study toward the degree of Applied Scient applicant must possess a bachelor's degree in either engineering, mat or natural science; and a Master's degree in either engineering, natural mathematics, or administration. Applicants having an equivalent qual background may be considered as special cases by the respective depa

Normally, a *B* average in graduate work is required. However, the min does not assure automatic acceptance; the departments may, and often d higher admission standards.

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engi and Applied Science. They must be submitted, together with the nonrefun

pplication fee of $25, to the Manager of Engineering Admissions, Room 103, ompkins Hall of Engineering, George Washington University, Washington, .C. 20052, no later than August 15 for the fall semester, December 15 for the pring semester, May 1 for the first summer session, December 15 for the ummer session, and July 1 for the third summer session. The applicant must equest each educational institution attended since high school graduation to end an official transcript of the student's record directly to the Manager of ngineering Admissions. The applicant will be notified by mail when a de- ision on admission has been made. English language and other pertinent re- irements for international students are on pages 15–18.

All inquiries and correspondence relative to graduate admission should be irected to the Manager of Engineering Admissions.

RANSFER CREDIT

p to 6 semester hours of satisfactory credit (with grades of *A* or *B*) beyond a aster's program, which must have been earned in the five years preceding the art of study toward the Professional degree, may be accepted in transfer when pplicable to satisfy Professional degree requirements in this School. However, tudents must, with the approval of their adviser, petition the appropriate De- artment Chairman for such a transfer.

ogram of Study

pon admission, the student is assigned an adviser. Programs are determined by tablished prerequisites and the requirements of the department in which the tudent wishes to study. The program of studies for each Professional degree andidate must be approved by the student's adviser and the appropriate De- artment Chairman.

An applicant who has significant deficiencies in preparation may be required take prescribed undergraduate and graduate courses before being admitted to rofessional degree candidate status. In no case may these courses thus taken nal any part of the requirements for the Professional degree.

Each individual department may require the degree candidate to undertake d defend the results of a technical design project, development problem, or preparation of a comprehensive technical report to demonstrate the candi- te's ability to make independent use of the knowledge and discipline of ught acquired and developed by graduate study. When applicable, the stu- nt will be informed of this requirement by the faculty adviser at the time the dent's program is being formulated.

In no case, however, will this project be more than 6 credit hours out of a nimum of 30 credit hours.

olarship

student studying for the Professional degree may receive more than two rse grades below *B*. If more than two course grades below *B* are received, dy is terminated and further enrollment is prohibited. A student must achieve al quality-point average of 3.00 to receive the degree.

Time Limits

A full-time student in the Professional degree program is allowed a
of three calendar years to complete all degree requirements, from the
first graduate student status registration in prerequisite or graduate c
part-time student in this program is allowed a maximum of five calen
The time limit does not include any period of registration as an u
student before admission to graduate student status, nor does it encom
specified period spent on approved leave of absence. Upon expiration
of absence, readmission is required under the conditions and require
effect at the time of the student's readmission.

Students who do not complete degree requirements within the allo
will have their graduate status terminated. They may be readmitted to
status under conditions specified by the Department Chairman.

Interrelationship with the Doctoral Program

Candidates for the D.Sc. degree or Professional degree who are in g
demic standing may, with the approval of the faculty adviser and de
chairman, transfer from one degree program to the other, if they meet
qualifications and requirements as specified by the appropriate departme

Residence and Continuous Study

All work for the degree must be done in residence on the campus exce
special permission is granted by the Department Chairman. The studen
maintain continuous enrollment in the School. Failure to do so ter
student's registration, and the student must apply for readmission to
fessional degree program under whatever conditions and regulations
effect at that time.

DOCTORAL DEGREE PROGRAM

The School of Engineering and Applied Science offers a program of s
study and research leading to the degree of Doctor of Science. This
is limited to those fields in engineering or applied science in which a
has been established and for which the University has or can arrange
resources.

The doctoral program is designed to prepare the student for a career
tive scholarship by providing a broad but balanced background of k
and guidance in the performance of research. It requires study of inte
fields of learning as well as original research in the field of central inte

The program for the degree is divided into two stages. The first
of a study of interrelated fields of learning which supports the genera
research concentration—culminates in the qualifying examination. The
—composed of research investigation of a particular subject in a spec
and the presentation of such research findings in a written dissertation
nates in the final examination.

Admission to Doctoral Study

A satisfactory Master's degree from an accredited institution is ne
gether with acceptable personal qualities and a capacity for creative

hip. Normally, a *B* average in graduate work is required. However, the mini-
um does not assure automatic acceptance; the departments may, and often do,
t higher admission standards.

DMISSION PROCEDURE

orms for application for admission are available at the School of Engineering
d Applied Science. They must be submitted, together with a nonrefundable
pplication fee of $25, to the Manager of Engineering Admissions, Room 103,
ompkins Hall of Engineering, George Washington University, Washington,
C 20052. The prospective doctoral student seeking admission should apply
efore June 1 for the fall semester and before December 1 for the spring
emester. Personal interviews may then be arranged to discuss the applicant's
ualifications and the possibilities for an effective doctoral program. The appli-
ant must arrange for complete documentary records (transcripts) to be for-
arded to the Manager of Engineering Admissions in sufficient time to permit
ssembly of complete records for evaluation as soon after the above application
eadlines as possible.

The applicant must arrange for letters of recommendation to be submitted
om two faculty members of the institution from which the student received
e Master's degree; one of these, if possible, should be from the Master's ad-
iser. The letters should be addressed to the appropriate department chairman.
English language and other pertinent requirements for international students
e given on pages 15–18.

nguage Requirement

octoral student should maintain a broad outlook as he pursues his study,
therefore must have the capability of reading appropriate literature pub-
d in a foreign language. Accordingly, a reading knowledge of one foreign
nguage, preferably Russian, must be demonstrated before admission to the
ying examination. Students who wish to satisfy this requirement with a
nguage other than Russian, must obtain the approval first of the doctoral
iser, then of the Department Chairman; permission to use a language other
Russian will be granted on the basis of its importance to the student's
ld of interest.

l Requirement

ddition to the language requirement, an examination in a tool requirement
., computer programming) may be established by the various departments.

dy for the Qualifying Examination

on admission to the first stage of the program, *i.e.*, study of interrelated
s culminating in the qualifying examination, the student is assigned a fac-
adviser who directs his studies.* The adviser approves appropriate fields
udy to insure the student's breadth of knowledge and to support research
e central field of interest, gives advice concerning the scope and content of
s of study, and guides preparation for the qualifying examination. Pro-
ms of study are normally structured to include a major field of study and
minor or supporting fields.

minimum of 30 semester hours of credit in a formal program at the grad-
evel beyond Master's study is required. In many cases, particularly when

some departments, instead of a faculty adviser, a faculty committee may be appointed to
e programs, direct study, and carry out all other responsibilities of the faculty adviser.

the student undertakes a doctoral program in a field other than that in
the student obtained the Master's degree, the program of studies exc
semester hours.

Students admitted to doctoral study are encouraged to undertake one
full-time study on campus. In general, the adviser will require the stu
register for a minimum of 6 semester hours of course work in every
except the summer sessions.

Transfer of Credit

Up to 6 semester hours of credit earned in courses completed with th
of *A* or *B* while enrolled in a doctoral program at another accredited
tion may be accepted in transfer to satisfy doctoral requirements of this
subject to the approval of the student's adviser and the Department Chai
Credit earned in courses completed more than five years prior to admis
the doctoral program will not be accepted in transfer, and some depart
may require that transfer credit must have been earned within a shorter
of time before admission.

The Qualifying Examination*

The purpose of the qualifying examination is to ascertain that the st
background and intellectual development are adequate to support doct
search in the central field. Qualifying examinations may be written or
both, and are scheduled over a period of several days. They are conducte
during the fall and spring semesters on dates established by the depa
and are administered by a faculty committee. Upon favorable report
examiners to the Dean through the appropriate department chairman.
dent is admitted to candidacy for the degree; the student then begins spe
study and research under the supervision of a designated member of
ulty or, in special instances, an outstanding engineer/scientist who
member of the faculty.

The qualifying examination is the principal means used to determ
student's ability to qualify as a candidate for the doctoral degree and
the second stage of the program.

At the discretion of the committee which prepared the examination,
toral student may be given a second opportunity to qualify for candidac
event of failure in any part of the qualifying examination. In general, th
qualifying examination must be retaken by the student in order to qual
candidacy.

Scholarship

To be admitted to the qualifying examination, the doctoral student
an overall quality-point average of 3.20 (quality points are computed
lows: *A*, 4.00 points; *B*, 3.00 points; *C*, 2.00 points: and *F*, no points). N
toral student may receive more than two course grades below *B*. If the
does receive more than two course grades below *B*, the graduate study
nated and further enrollment is prohibited. Courses in which the stud
grades below *B* are not included in the total semester-hour requirement
degree. Students who receive any grade below *B* are required to con
their adviser for a review of their program of study and discussion of
changes therein.

* Some departments may administer a pre-qualifying examination prior to completion of
program.

esearch, Dissertation, Final Examination

he student admitted to candidacy for the degree of Doctor of Science requests s Director of Research, the member of the faculty under whom the student shes to conduct research. The research area is approved by the Director. Throughout the remainer of the doctoral program the candidate conducts dissertation research directly nder the Director. However, the student is not precluded from consulting with ther members of the faculty, as may be required, on an informal basis, and ay be encouraged to do so by the Director of Research. A committee of the aculty consisting of three members including the Director as chairman will dvise in the final preparation of the dissertation. The Department Chairman ppoints such a committee on the recommendation of the Director of Research. ork on the dissertation is equivalent to a minimum of 24 semester hours. See ge 206 for minimum hour-loads for doctoral students.

HE DISSERTATION

dissertation is required as evidence of ability to perform original scholarly search and to present and interpret the results. The student is solely respone for the content of the dissertation.

The aim of the student in this stage of candidacy is the production of a sertation which embodies the results of an extended original study and which ludes material deemed worthy of publication in recognized scientific and enering journals. The student is expected to attempt to publish the results of research as soon as possible after the student receives the degree and to rnish copies of the published material to the Dean. Credit must be given in publication to the fact that the material is abstracted, summarized, develed, etc., from a dissertation submitted to George Washington University in rtial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the appropriate department five complete cop- of the dissertation and an abstract (not to exceed 600 words) of the disser- on no later than the date specified in the calendar. The abstract is included the announcement of the examination and is reproduced by University Mifilms, Inc. One copy of the dissertation is also sent to University Microfilms, .

Printed copies of detailed regulations regarding the form and reproduction the dissertation, preparation of the abstract, and services offered by Univer- Microfilms, Inc., are available at the School office. The successful candie for the doctorate is required, before receiving the degree, to pay a fee to er a part of the expense of printing the abstract of the dissertation, and for basic service rendered by University Microfilms, Inc. Accepted dissertas, with accompanying drawings, become the property of the University and deposited in the University Library, where bound copies are available for ulation.

E FINAL EXAMINATION

on acceptance of the dissertation by the committee, consisting of the Direcand two other faculty members of this School, which has assisted in super-

vising its final preparation, the candidate is presented for the final exami
The final examination is oral and is open to the public. The candidate
demonstrate a mastery of the special fields of study and of the materia
techniques used in the research. The committee of examiners will consist
less than five members, three of whom must be full-time faculty me
The committee may include qualified experts brought to the Univers
cially to participate in the examination. The Director of Research se
Advocate for the candidate. When the candidate satisfies the examining
mittee of the high quality and originality of the candidate's contribut
knowledge as well as the mastery of the scholarship and research techn
of the field, the committee of examiners recommends the candidate for
gree of Doctor of Science. The final examination is conducted only duri
fall and spring semesters. The candidate should consult with the appro
department chairman as to possible dates for the examination.

Residence and Continuous Study

All the work for the degree must be done in residence on the campu
cept when special permission is granted by the Department Chairman
student must maintain continuous enrollment in the School. Failure
so breaks the registration, and the student must apply for readmission
toral study under whatever conditions and regulations are in effect at th
In case of incapacity or other legitimate reasons, the student may be gra
leave of absence of up to one year. Extension of such leave will requi
cial request to and approval of the appropriate department chairman
approved leave of absence, the student must maintain continuous
ment. The time period for completion of all requirements for the degre
be adjusted on the basis of the approved leave of absence.

In general, one year of study is the minimum amount of time to be
preparation for the qualifying examination. The qualifying examinatio
be completed within five years of the date of admission, and the entire
program must be completed within seven years. After admission the
may apply for the qualifying examination whenever the student feels
prepared. A minimum of two years of full-time study and research sho
expected in meeting the requirements for the degree.

Special Programs

INSTITUTE FOR THE STUDY OF FATIGUE, FRACTURE, AND STRUCTURAL RELIABILITY

The basic objective of the Institute for the Study of Fatigue, Fractu
Structural Reliability of the School of Engineering and Applied Scienc
develop an interdisciplinary approach to fatigue research through close
tion of research workers from different fields. The Institute deals pri
with the study of the physical mechanism of damage initiation, in
establish principles for the rational design of metal alloys of superi
performance on the one hand, and to develop advanced methods of
design and reliability on the other. Because of the large volume, past, a
rent, of straight fatigue testing of standard test specimens in industrial

ment, and university laboratories, no testing of this type is generally conducted by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. In addition to advancing interdisciplinary research, the Institute provides specialized training for graduate students.

The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

NSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

The Institute for Management Science and Engineering defines and develops ew analytical management techniques required to keep pace with an ever-exending technology. It provides a multidisciplinary environment for innovative raduate teaching and substantial opportunities for research activities and public ervice under diversified sources of external support. The principal academic elds directly involved are operations research, mathematics, statistics, economt, and the computer sciences.

The programs of the Institute are concerned with important educational and blic-service needs for conservation of national resources. Such programs quire full-time interaction among students, faculty, and staff in ways posle only at universities. Through its Program in Logistics, the Institute perms research leading to the development of a science of logistics featuring nciples and methodology for resource allocation problems in civil affairs and tional defense efforts. Other programs involve optimization, reliability, queu, forecasting, and cost benefit analyses.

Participation by faculty members and graduate students from all schools the University is encouraged as consistent with the multidisciplinary obtives of the Institute. Graduate students are supported through research sistantships with thesis and dissertation efforts ordinarily being the major ork responsibilities. Reliance is also placed on staff research specialists, and re are special provisions for substantial contributions from distinguished visis from government, private industry, and other universities.

The Institute disseminates its results through seminars, colloquia, conferences, d a special series of monographs. All research is unclassified.

HE GWU-NASA-LANGLEY GRADUATE PROGRAM

orge Washington University, in cooperation with the National Aeronautics d Space Administration's Langley Research Center, has a full-resident grade engineering program at NASA-Langley, in Hampton, Va., approximately 0 miles south of Washington, D.C.

The program is open to qualified NASA employees and area residents. urses may also be taken by nondegree students, with the approval of the ructor. Students may be permitted to transfer a maximum of 6 semester rs of approved graduate course credit from other accredited institutions.

ourses in the program are taught by NASA scientists and engineers and faculty of the School of Engineering and Applied Science. NASA-Langs extensive scientific and engineering facilities and equipment are utilized never feasible.

The program at NASA-Langley leads to the degrees of Master o and Doctor of Science (by special permission of the appropriate de chairman) and to the Professional degree of Engineer in the fields of aeronautics, environmental modeling (M.S. degree only), fluid mecha thermal sciences, solid mechanics and materials engineering, structures namics, and electrical engineering and computer science (M.S. degree o

Information regarding this program may be obtained from John L sides, Jr., GWU-NASA Program, Mail Stop 69, NASA-Langley Resear ter, Hampton, Va. 23365.

The GWU/NASA-Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established through the combined efforts of the National Aeronautics and Space A tration's Langley Research Center and the George Washington Univ School of Engineering and Applied Science. The objective of the JIAF gram is to meet the nation's ever-increasing needs in the advancem science, engineering, and technology and to prepare qualified students reers in research, development, design, and teaching. The Institute, located at the Langley Research Center in Hampton, Virginia, is dedic the advanced training of students and professional engineers in acoustics nautics, environmental modeling, materials science, structures and s and other relevant areas, and serves to provide a center for advanced by bringing together researchers and scholars from these fields for the of ideas and findings. It is also the purpose of the Institute to pro necessary facilities for qualified researchers and scholars who want to in research work in these areas.

The organization of the Institute consists of a director, John E. Dugu sociate Director of the NASA-Langley Research Center, and a co-d Harold Liebowitz, Dean of the George Washington University's Sch Engineering and Applied Science.

The education and research opportunities offered in the program com academic resources of George Washington University and the pro research assets and facilities of the NASA-Langley Research Center opportunities also enable students to involve themselves in research that excite their interest and permit them to associate with prominent members who are working on related problems. Most of the fac NASA scientists conduct research, and students take part in the initia ciation of research and instruction from the day of their arrival. It is that the experience of the students during their stay at NASA-Langley Center will be highly rewarding and beneficial.

The current education and research programs are the following:

Acoustics Program—This program is concerned with the problems of ating noise and with providing a technical base for design of acceptable and space vehicles, noise resistant structures, and ground transportation Areas of research interest include boundary-layer noise, duct acoustics, nonlinear problems in acoustics, structural response to noise, and mat and acoustical coupling problems.

Aeronautics Program—This program deals with advanced flight concepts of various types of aircraft, including areas of performance, flight dynamics, instrumentation, guidance and control, aeroelasticity, and systems analysis. Specific research areas currently being investigated include aerodynamic analysis of jet augmented wings, theoretical fluid mechanics, performance, stability and control of aircraft, wind tunnel and flight testing of aircraft, airfoil aerodynamics, spin-spin characteristics of aircraft, and experimental evaluation of aircraft handling characteristics.

Structures and Dynamics Program—This program is designed to provide a basic understanding and working knowledge of some key areas pertinent to structures, solid mechanics, and dynamics technology including computer-aided design: optimum design of aircraft and of aerospace and other structures; and the dynamic and aeroelastic response of large and complex structures. Emphasis will be placed not only on these individual areas but also on their interface and interaction.

Environmental Modeling Program—This program is aimed at developing mathematical models of various aspects of atmospheric energy and mass transport and in applying these models both to the prediction of pollutant distribution and transport and to the interpretation of satellite and aircraft measurements. Because of the complexity of the earth-atmosphere system, simplified models are necessary to understand the effects of pollutants on the energy balance, the atmospheric circulation, and the chemistry of the system.

Materials Science Program—This program is concerned with analytic and experimental verification of processes which degrade mechanical properties of advanced composites; analysis of corrosion and stress-corrosion of materials in environments encountered by aerospace vehicles; analysis of creep and cyclic deep materials, based on both deterministic models and multiparameter regression and prediction of mechanical properties of engineering materials in terms of composition, processing conditions, and service history.



Participating in these programs are Graduate Student Research Scho
ants, faculty from George Washington University, scientists and engi
NASA-Langley, and visiting scientists and engineers.

A number of Research Scholar Assistantships are available to qu
dents seeking an outstanding opportunity for graduate study and rese
ing to the degrees of Master of Science and Doctor of Science in th
Acoustics, Aeronautics, Environmental Modeling, Materials Science,
tures and Dynamics. Applicants who are awarded Research Scholar
ships will receive stipends of up to $10,000 a year for a Master of S
gree and $11,000 a year for the Doctor of Science degree. Appli
JIAFS brochure, and additional information may be obtained from
L. Whitesides, JIAFS—George Washington University, Mail Stop 16
Langley Research Center, Hampton, Virginia 23665.

COOPERATIVE EDUCATION PROGRAM IN ENGINEERING

Cooperative education is a process of education which formally integ
student's academic study with work experience in cooperating employe
zations. The usual plan is for the student to alternate periods of colle
with periods of experience in appropriate fields of industry and gove
The experience periods are considered an integral part of the student's
tion. Through the interaction of the study and work experiences, the
enhances academic knowledge, personal development, and professional
tion. The teaching faculty, the coordinators, and the employing sup
share in the educational process of the cooperative student.

The following factors are adhered to as closely as possible for the s
working experience:

1. The student's employment is related as closely as possible to the
study and to individual interest within the field.

2. The employment is considered to be a regular, continuing, and
element in the educational process.

3. The working experience will ideally increase in difficulty and re
bility as the student progresses through the academic curriculum. Norma
salary of the student will increase accordingly.

The student's working experience in industry or government provi
opportunity to meet and work with men and women under varied cond
to get along with them, learn from them, respect them, and earn their
Indeed, these advantages alone could be as important in shaping a you
son's life as the opportunity to obtain experience in a chosen field.

International students face several constraints in finding jobs and sho
depend on cooperative education income as a financial aid. Internat
dents with permanent visas, however, will have better opportunities for

Advantages of Cooperative Education

Combines Theory and Practice—By coordinating the work experie
industrial and governmental organizations with the campus education
theory and practice are closely integrated, and students find greater mo
in their studies. As a result of this alternation between academic and w
environments, the student tends to understand the role and meaning o
environment, with a deeper appreciation for each.

Helps Finance Educational and Living Expenses—The student's earnings will contribute substantially to financing his own education and living expenses, leading to independence and contributing significantly to self-esteem and confidence. As stated earlier, it is expected that as the working experience increases in difficulty and responsibility as the student progresses through the academic curriculum, the salary of the student will increase accordingly.

Serves as a Bridge to the Future—Cooperative education helps markedly to orient students to the world of work. Most students are genuinely concerned about their future life work. They want to know more about the range of occupations open to them, and the potentials and limitations of these fields. They want to know about the qualifications demanded and their own fitness. Through cooperative education programs, students have opportunities for exploring their own abilities in connection with real jobs, and they find a direct means of gaining information and guidance not only in the occupations in which they are employed but in a number of related fields as well. They have a chance to test their own aptitudes more fully than is normally possible on campus.

Increases Motivation to Achieve—This coordination of work and study increases student motivation. As students see connections between jobs they hold and the things they are learning in school, greater interest in academic work develops. During the work periods there is a tendency for the student to develop good work habits because his efforts as a productive and salaried employee are rated by the employer.

Enhances Human Relationships—Because the work experiences involve the students in relations with co-workers who come from a variety of backgrounds, and because success in these jobs requires constructive relationships with colleagues, most students in cooperative education develop deeper understanding of other people and greater skills in human relations.

Augments Development of Maturity—For many students the work experience contributes to an increased sense of responsibility for their own efforts, greater dependence on their own judgments, and a corresponding development of maturity. In addition, the student's role as a team member in a real and productive working environment inculcates a seriousness of life and purpose which is often delayed for the traditional college graduate.

Responsibilities of the Cooperative Student

The cooperative student working in association with the professionals in the field must adopt professional standards of conduct. Such a student is also a representative of the George Washington University School of Engineering and Applied Science. After each work period the student prepares a report describing the duties and responsibilities at work, and the supervisor sends an appraisal of the student's work performance to the Cooperative Program Coordinator. These reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the employer, and George Washington University. The student's responsibilities extend equally to each of the other two members of the partnership, and the partnership cannot be altered during the program without the knowledge and consent of all.

The cooperative student must maintain continuous enrollment in the School for each semester the student is away from the School on a work period. Failure to do so breaks the student's registration, and the student must apply

for readmission to the undergraduate degree program under whatev
tions and regulations are in effect at that time.

Why Employers Participate in Cooperative Education Programs

Industry and government agencies have found that cooperative stu
valuable employees. Generally speaking, they are alert and energeti
people who, stimulated by a definite goal, return more than a day's w
day's pay. Graduates of the cooperative program represent a good so
well-trained manpower. The training period provides an opportunity
employer to evaluate the student as a prospective permanent employe
ployers feel that this program is an important part of their effort to att
qualified employees. At the same time, the student is able to evaluate
ployer in terms of future plans and interests. About half of the coop
graduates establish such mutually beneficial relationships with their em
that they remain in permanent employment after graduation, with a sub
head start in their careers.

It is emphasized, however, that neither the student nor the employe
ligated for permanent employment after graduation. Industry and g
agencies consider participation in cooperative education as a long-range
ment rather than a current expense. As a partner with the University,
ployer is engaged in a joint effort to develop young talent more fully,
suring better education for the student, improved utilization of the s
and greater cooperation with the University.

Scholastic Requirements

Students entering the program must be in good academic standing and
have completed at least two semesters of academic study prior to their fi
time work assignment. To remain in the program, the student must m
passing average and perform satisfactorily for the employer.

Living Accommodations

Arrangements will be made for students in the cooperative program to
their dormitory and dining privileges at the University, if they so desire.
the work periods. During this time, they will also retain full student s
and have access to all University facilities. Faculty will be available for
sultation by appointment.

Work-Study Schedules

At this time, individual schedules are being arranged with the various
ers in Washington and other areas. Since each employer operates diff
special schedules are arranged which are mutually satisfactory to the s
the employer, and the School.

Generally, after the student has successfully completed the first
study, a schedule is arranged with the employer. Many employers will
the student to work during the summer immediately following the fre
year. The student returns to the School for the sophomore year, work
during the second summer. Beginning with the third year, students alte
tween employer and classroom each semester for the next two years, w
to the classroom for the fifth and final year. An alternate method is to
full academic year and then return to school. Schedules for transfer

re arranged on an individual basis according to the number of credit hours ransferred and the employer's requirements.

Arrangements have been made or are in progress with many businesses, indus- rial organizations, and governmental agencies for employment opportunities. ew cooperative job opportunities, however, are available for the summer just rior to the freshman year.

uition Aid

nder the Tuition Aid Program offered by certain employers, up to 50 per- ent of the cost of tuition, textbooks, and fees (exclusive of room and board) may be granted. If tuition assistance is received, the cooperative student will ave to agree to serve as a government civilian employee after graduation for period to be determined by regulations in effect at that time. As a civil ervice employee, the co-op student is eligible for many federal benefits, in- luding annual leave, sick leave, paid holidays, health benefits, and life in- rance.

pplications

pplications for the Cooperative Education Program from registered or trans- r students should be submitted at least ten weeks prior to the beginning f the first work period. It is recommended, however, that applications be sub- tted four months in advance of the work period. Transfer students who meet dmission requirements may apply for a work assignment during the summer semester just prior to their registration at this University.

NDERGRADUATE DUAL-DEGREE PROGRAMS WITH HAMPTON NSTITUTE, BOWIE STATE COLLEGE, VIRGINIA OMMONWEALTH UNIVERSITY, AND ST. JOSEPH'S COLLEGE

e School of Engineering and Applied Science, Hampton Institute, Bowie ate College, Virginia Commonwealth University, and St. Joseph's College, all which are accredited four-year degree-granting institutions, have established ual-degree program that joins general education and career education in a que and comprehensive experience. This program is in addition to the en- eering programs already offered on the campus at George Washington Uni- sity.

Hampton Institute, Bowie State College, Virginia Commonwealth University CU), and St. Joseph's College (SJC) offer several four-year degree programs a variety of disciplines. To provide opportunity for careers in engineering, mpton Institute, Bowie State College, VCU, and SJC joined with the ool of Engineering and Applied Science, which offers accredited four-year grams in engineering.

Students enrolled in the dual-degree program first follow a general plan of dy for three years at Hampton Institute, Bowie State College, VCU, or This program is based on the social sciences, humanities, and the pre- tory background engineering courses in mathematics, physics, and chemis- which help develop broad cultural perspectives, analytic abilities, and com- nication skills.

After successful completion of the first phase of study, students th
a two-year career program in engineering at the School of Engine
Applied Science. During this phase of the study, students may spe
any of the following areas of engineering, which are also offered
Washington University's regular four-year programs:

1. Civil Engineering or the following option: Geotechnical Civil En

2. Electrical Engineering or the following options: Computer Scie
medical Engineering.

3. Mechanical Engineering or the following options: Energy- or C
oriented Mechanical Engineering.

4. Operations Research and Computational Science.

Students may begin their education at Hampton Institute, Bowie St
lege, VCU, or SJC and then obtain a B.S. in an engineering
George Washington University. This unique academic background pro
student with many options in choosing a profession upon graduation.
dent may go into engineering practice, continue study for advanced
or enter other professional areas such as law, medicine, or teaching.

Dual-degree students, while at Hampton Institute, may participat
Summer Training Program. In this program, students may work for a
period during the summer at the Joint Institute for Advancement
Sciences at the National Aeronautics and Space Administration's
Langley Research Center in Hampton, Va., obtaining valuable work ex
in a first-rate laboratory while earning funds for the following acade
This program may be made available to some prefreshmen who desire
upon graduation from secondary school.

Dual-degree students may avail themselves of summer employment
the George Washington University's Cooperative Education Progra
neering prior to their actual attendance at George Washington Univ

In George Washington University's Cooperative Education Program
neering (see pages 42–45), a student may work summers and one or
demic semesters and earn sufficient funds to help pay expenses while
valuable engineering experience.

The dual-degree program offers the student time to become accli
college life and study at a reasonable cost while preparing for an ex
rewarding profession.

For further information write or call Dean of Admissions and
Hampton Institute, Hampton, Va. 32668, (804)727-5328 or 727-5
Johnny W. Ponds, Mathematics Department, Bowie State College, B
20715, (301)262-3350; or Prof. William Sloope, VCU, (804)257-
Betty Markham, Mathematics Department, St. Joseph College, West
Conn. 06117, (203)232-4571; or Manager, Engineering Admissions
Engineering and Applied Science, George Washington University, W
D.C. 20052, (202)676-6158.

ONTINUING ENGINEERING EDUCATION PROGRAM

oday most engineers and their employers are well aware of the rapid ad-nces of knowledge in science and technology. The inability to understand nd to make timely applications of new technologies can mean both personal nd corporate failure. To prevent this potential obsolescence, engineers must volve themselves in a continuing program of technical reading and organized arning.

The School of Engineering and Applied Science meets this need with a com-rehensive program of noncredit courses. The program's objective is to in-rease the competence of practicing engineers rather than to grant further aca-emic degrees. Staff reorganizations require many engineers to change their pecialties or to take on additional duties within their present jobs. Continuing ngineering education can provide the education and skills the engineer needs to ffectively make these changes. Continuing engineering education also aids in ualifying for promotions and in maintaining certification in certain professional elds.

The program will present about 400 noncredit courses this year. About half f them last for five days (30 classroom hours), while others are for two, three, r four days. Some courses are presented in the evening (two-hour sessions nce a week for 8 to 12 weeks), or on Saturday morning. Presentation of eory is often augmented by workshops to give registrants practice in the spe-ic discipline. All courses stress practical applications. Students from all over e nation and from many foreign countries have participated in courses. The ariety of experience and background of these students enriches the classroom scussions.

January 1980 will mark the initiation of a major undertaking to make this ogram available in Europe at the International Congress Center in Berlin. irty-five courses will be offered during the first year, and plans have been ade to increase the number of courses to 225 per year within three years. ose areas of advanced technology in which the United States is a leader ll be emphasized.

Subjects which have been presented in the Continuing Engineering Education ogram include:

ectronics/Communications/
mputers
tennas
plied Digital Control Systems
vances in Electronic Technology
vanced Radar Technology
C and SAW Devices for
ommunications, Radar and Signal
rocessing
mputer Communication Networks
mputer Graphics
mputer Performance Evaluation
mputer Programming for the
Non-Programmer
mmand, Control and
ommunications
Computer Assisted Makeup and Imaging Systems
Computer-Aided Design
Computer-Aided Manufacturing
Computer Output Microfilm
Computer Cryptography
Computer Security
Computers in Public Affairs
Configuration Management of Software Programs
Data Base Management
Data Communication
Data Communications Systems and Networks
Digital Transmission System Engineering

Digital Communications Processing and Coding
Digital Electronics for Non-Electrical Engineers
Digital Satellite Systems
Digital Signal Processing
Digital Telephony
Distributed Processing
ECM and ECCM for Digital Communications
Move to Environment and Energy
Electromagnetic Interference and Control
Electronic Display
Fiber and Integrated Optics
Fiber Optics System Design
Hazardous Electromagnetic Radiation
Integrated Circuit Engineering
Lightning Protection
Magnetic Bubble Memory
Mapping from Space
Microcomputers for Small Business
Microcomputers in Control Systems
Microprocessors and Microcomputers
Microwave Circuits for Communications and Radars
Minicomputers
Modern Digital Communications
Modern Microwave Techniques
Optical Engineering
Packet Switching Protocols
PASCAL Computer Programming
Practical Electronics
Radar Systems
Protective Relaying for Power Systems
Radar Signal Processing
Radiowave Propagation in Satellite Communication Systems
Remote Sensing and Digital Information Extraction
Satellite Communications
Satellite Systems for Navigation, Traffic Control and Surveillance
Simplified Math for Electronics Applications
Solid State Electronics for Non-Electrical Engineers
Sonar Signal Processing
Sonar Systems
Software Reliability Models
Small Computers for Business and the Professions
Software Quality Assurance
Spread Spectrum Communications
Structured Programming and Software Engineering
Telecommunications
Telecommunications Policy
Telephone Equipment Registration for Voice/Data Interconnection
Telephone Networks-Switching Concepts
Wideband Communication Systems
Vulnerability of Spread Spectrum Communications

Mathematical Methods in Engineering

Analysis of Variance
Applied Numerical Methods
Applied Statistical Theory
Fault Tree Analysis
Finite Element Method
Forecasting Techniques
Nonparametric Statistics
Operations Research
Statistical Methods in Discrete Event Simulation
Tools for the Data Analyst
Time Series Analysis and Forecasting
Working Statistics for Engineers

Program and Cost Management

Configuration Management
Facilities Management
Life Cycle Cost Analysis
Forecasting Techniques
Finance for Engineers
Management by Objectives
Management of Project Documentation
Management Skills for Engineers and Scientists
Managerial Decision Making
Microfilm Information Systems
Project Management
Quality Control Engineering
The Automated Office and Maintainability

Safety and Reliability
Maintainability Engineering
Mechanical Reliability
Reliability of Nuclear Power Plants
Hazardous Industrial Materials
System Safety
Systems Approach to Managing Hospital Risk
Statistical Methods in Reliability

Medical Engineering
Intensive and Coronary Care Units
Clinical Engineering Management
Biomedical Equipment in Health Care Facilities
Maintenance Management of Medical Instrumentation
Surgical Operating Suites

Environment and Energy
Air Pollution Control Equipment Operation and Maintenance
Controlling Particulate Emissions
Energy Conservation
Glossay Aspects of the NPDES Permit
Cogeneration Systems
Energy Forecasting
Environmental Impact Statements
Environmental Law
Fluidized-Bed Combustion
Industrial Exhaust Ventilation
Industrial Noise Control
Industrial Wastewater Discharges
Oxygen Transfer in Wastewater Treatment
Solar Heating and Cooling
Temperature Control Systems
Wastewater Engineering
Water Recycle and Reuse
Wastewater Treatment in Continuous Loop Reactors

Materials/Structures/Construction
Finite Element Method and Computer Graphics in Structural Mechanics
Material Failure, Analysis and Prevention
Fibrous Composite Structures
Metal Fracture and Fatigue
Highway and Railway Bridges: Evaluation and Upgrading
Advanced Finite Element Method

General Courses
Applied Oceanography
Patent Law for Engineers and Scientists
Writing Technical Communications
Reservoir Engineering, Well Testing, Reserves and Production Estimates
Report Writing Workshops
Standards and Calibration Labs
Warehousing/Distributions Operations using Computer Systems
Standards and Specifications
Utilization of the Space Shuttle
Engineering Design of Packaging and Handling Systems
Applied Geodesy
Geological Hazards in Land Use Planning

New courses are developed as needs become apparent in various fields, and related courses are continuously revised. Over 80 new courses were added last year.

In addition to the faculty of the School of Engineering and Applied Science, outstanding lecturers and instructors from other universities, from industry, and from government laboratories and agencies serve on the instructional staff of the program.

The program also offers noncredit contract courses off campus specifically tailored for the needs and background of the engineers employed by a company or agency. Tuition for these courses is usually slightly lower than for those offered at the University.

To receive announcements or additional information on the progra
to Continuing Engineering Education Program, School of Enginee
Applied Science, George Washington University, Washington, D.C. 2
call (202) 676-6106 or (800) 424-9773.

Administration

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and
Science; Co-director of the Joint Institute for Advancement of Fl
ences; Director, Institute for the Study of Fatigue, Fracture, and St
Reliability*

James Elmer Feir, Ph.D., *Associate Dean of the School of Engineer
Applied Science*

Ali B. Cambel, Ph.D., *Chairman of the Department of Civil, Mech
and Environmental Engineering; Director, Energy Programs*

Donald Gross, Ph.D., *Chairman of the Department of Operations Re*

Arthur D. Friedman, Ph.D., *Chairman of the Department of Electri
neering and Computer Science*

Sam Rothman, Ph.D., *Chairman of the Department of Engineering Ad
tration*

William H. Marlow, Ph.D., *Director, Institute for Management Scien
Engineering*

John Edward Duberg, Ph.D., *Director of the NASA-Langley Graduat
gram; Director of the Joint Institute for Advancement of Flight Scie*

Malcolm P. Clark, M.S., *Administrator of the NASA-Langley Graduat
gram*

William F. Shanahan, B.S., *Manager of Engineering Admissions and Co
tive Education Program*

John Lindsey Whitesides, Jr., Ph.D., *Assistant Director, Research and
tion, Joint Institute for Advancement of Flight Sciences*

J.W. Perkins, B.S., *Director of the Continuing Engineering Educatio
gram*

Frederic A. Hooper, M.S., *Research and Resources Officer*

George Ellowitz, B.A., *Executive Associate to the Dean*

DEAN'S COUNCIL

Harold Liebowitz *(Chairman)*, R.R. Fox, T.G. Toridis, Henry Steine

Advisory Council*

The purposes of the Advisory Council for the School of Engine
Applied Science are to strengthen communication between the Schoo
other colleges, schools, and divisions of the University as well as be

* The President of the University, the Vice President for Academic Affairs, and th
School of Engineering and Applied Science are *ex officio* members of the Advisory Co

School and the University's Board of Trustees; to advise on the programs of instruction, research, and service in the School and to help interpret these programs to the community and the nation; and to stimulate support for the continued development of the School and its programs.

MEMBERS OF THE COUNCIL FOR 1980–81

Chairman: Stephen R. Woodzell *(University Trustee), former President of the Potomac Electric Power Company*
Raymond L. Bisplinghoff, *Tyco Laboratory*
Bruno A. Boley, *Dean, Technological Institute, Northwestern University*
George M. Bunker, *President, Martin Marietta Corporation*
J.P. Chambers, *President, Melpar Division E-Systems, Inc.*
L. Stanley Crane, *President, Southern Railway System*
Joseph M. Fox, *Chairman, Lesco/Fox Associates, Inc.*
Moses Freedman, *Vice President, Blake Construction Company*
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Alexander Hassan, *Washington, D.C.*
Walter R. Hibbard, Jr., *Professor, Virginia Polytechnic Institute, Blacksburg*
William Holt, *Carborundum Company, Niagara Falls, N.Y.*
William H. Marlow, *Professor, Department of Operations Research*
Coleman Raphael, *President, Atlantic Research*
Bernard A. Schriever, General USAF (Ret.), *Chairman of the Board, Schriever & McKee Associates, Inc.*
Arthur W. Sloan, *Chief Executive Officer, Susquehanna Corporation*
Wayne G. Shaffer, *President, Vitro Corporation*
Edward G. Uhl, *President, Fairchild Industries, Inc.*
Ernst Weber, *Chairman, Division of Engineering, National Research Council*
Harold A. Wheeler, *Chief Scientist and Chairman, Hazeltine Corporation*
James F. Young, *Vice President—Engineering, General Electric Company*
L.A. Zadeh, *Chairman, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley*

PROGRAMS OF STUDY AND COURSES OF INSTRUCTION

On the following pages are listed programs of study, curricula, an of instruction offered by the School of Engineering and Applied Sci

Students who are not candidates for degrees but who wish to tak offered by the School should apply for admission to the Division of U Students.

EXPLANATION OF COURSE NUMBERS

Courses numbered from 1 through 199 are planned for undergradua although certain courses may be taken for graduate credit when arra are approved in advance by the instructor and the Dean. Courses n 201 to 300 are planned for graduate credit and may in certain inst taken by qualified undergraduate students. Courses numbered from 400 are primarily for doctoral students.

SEMESTER HOURS OF CREDIT

The number of semester hours' credit given for the satisfactory compl a course is indicated in parentheses after the name of the course. Thu course giving three hours of credit each semester is marked (3-3); semester course giving three hours' credit is marked (3). A semester h sists of the completion of one 50-minute period of class work or ei oratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following each course description is a parenthetical statement listing te ter for which the course is scheduled to be offered. The term "academic used only with two-semester courses, and indicates that the first ha course is to be offered in the fall semester and the second half in the semester; the term "as arranged" is used for courses which could scheduled at the time of printing this catalogue. Offerings for the sessions are not designated in this catalogue. Students should cons *Summer Sessions Schedule of Classes* for summer offerings. A *Sched Classes* is also published for each fall and spring semester which provides date information concerning the time of course offerings.

KEY TO ABBREVIATIONS

The following abbreviations for course designations are used by George Washington University.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BISc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
CIEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
For8	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gero	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Ids	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
RPol	Regulatory Policy
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

Applied Science

Interdepartmental offerings.

UNDERGRADUATE COURSES

57 Analytical Mechanics I (2)

First half of a one-year sequence. Concepts of statics, inc systems, equilibrium conditions, simple structures, distribu shear and moments, friction and the concept of work, virtua stability. Prerequisite or concurrent registration: ApSc 113, (Fall and spring)

58 Analytical Mechanics II (3)

Second half of a one-year sequence. Concepts of dynamics kinematics of particles, velocity and acceleration, Newton's la tion, momentum, work, kinetic energy, potential energy, co fields, vibrations, resonance, dynamics of systems of particles, of a rigid body, dynamics of a rigid body. Prerequisite: ApSc 5 and spring)

113 Engineering Analysis I (3)

Analytical methods appropriate to the solution of engineering including applications of ordinary differential equations, ma determinants, eigenvalues and eigenvectors, systems of ordin differential equations, Bessel and Legendre functions. Prerequi 33. (Fall and spring)

114 Engineering Analysis II (3)

Analytical methods appropriate to the solution of engineering including complex variables, Fourier series and integral, orthogo tions, Laplace transforms, partial differential equations in engine applied science. Prerequisite: ApSc 113. (Fall and spring)

115 Engineering Analysis III (3)

Solution of engineering problems using concepts from prob statistics, including random variables, distribution functions, ma expectation, point and confidence interval estimation, hypothes correlation, and regression. This methodology applied to pr structural design, bioengineering, manufacturing processes, proces equipment reliability, engineering management, and societal sy Prerequisite: Math 32. (Fall and spring)

116 Engineering Analysis IV (3)

Solution of engineering problems using advanced concepts in ability and statistics applied to problems of engineering design neering, production processes, engineering management, and soc neering. Prerequisite: ApSc 115. (Fall and spring)

RADUATE COURSES

211 Analytical Methods in Engineering I (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of Department. (Fall and spring)

212 Analytical Methods in Engineering II (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of Department. (Fall)

213 Analytical Methods in Engineering III (3)

Analytical techniques for solution of boundary-initial value problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of Department. (Fall and spring)

214 Analytical Methods in Engineering IV (3)

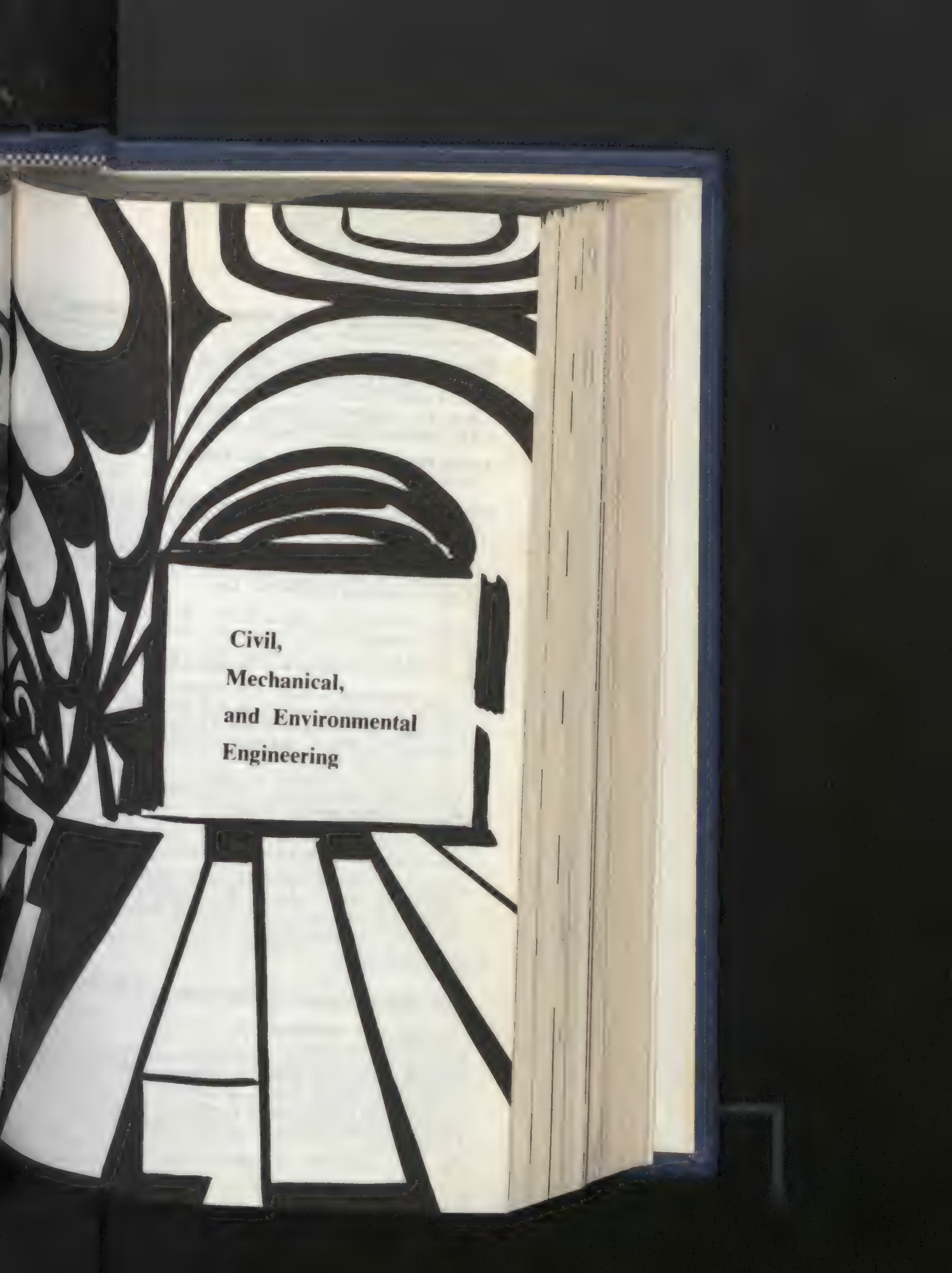
Introduction to variational methods in engineering including Ritz and Galerkin approximation methods of boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of Department. (Spring)

215 Analytical Methods in Engineering V (3)

Advanced methods of solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall)

216 Special Topics in Engineering Analysis (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; (2) application of singular integral equations in problems of mechanics; (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of Department. (Spring, even years)


Civil,
Mechanical,
and Environmental
Engineering

Civil, Mechanical, and Environmental Engineering

Professors G.M. Arkilic, R.R. Fox, H. Liebowitz, S.W. Yuan, T.G. Toridis, J.P. Campbell *(Research)*, J. Eftis, A.K. Noor, A.B. Cambel *(Chairman)*, K. Mahmood, A.M. Kiper, M.K. Yang, R.E. Kaufman, V. Yevjevich *(Research)*, A. Radkowsky, R.H. Korkegi, D.M. Esterling, C.M. Gilmore, J.L. Whitesides

Adjunct Professors J.E. Duberg, B.L. Clarkson, R.M. Sorensen, T.P.G. Liverman, M.P. Gaus

Professorial Lecturers R.E. Fulton, M.J. Queijo, J.B. Scalzi, L.K. L. Divone, L.G. Herman, M. Yachnis, W. Viessman, Jr., K.H. Erickson, J.A. Belding, Jr., N.L. Basdekas, B. Whang, M.S. Ojala gan, Jr., J. Weggel, T-F. Zien, D. Michel, A. Kotb, D.R. Lev amantiades, G. Banerian, H. Goldsmith, W.L. Harris, W.D. Jack Landon, G.D. Love, B. Miller, S-C. Liu

Associate Professors D.L. Jones, B. Bell, H. Runyan, Jr. *(Researc* Hafez *(Research)*, V. Klein *(Research)*, J.D-Y. Lee *(Research)*, C.

Adjunct Associate Professors B.W. Hannah, A.K. Trehan

Associate Professorial Lecturers R.W. Fralich, E.C. Yates, Jr., J. Sol Stein, R.W. Barnwell, T.M. Walsh, P.B. Buck, E.F. Skelton, H.A. J. Ettinger, H.E. Bethel, E. Glynn, P.L. Coe, Jr., C.J. Jachimows Cullingford, D. Feit, R. McConnell, J.C. Hardin, D.R. Tenney, H G.D. Love, A.M. Yen, J.C. Yu, R.Y. Ting, A. Kehnemui, E. Long, Park, H. Singh, D. Gubser, W. Kenis, S. Leighton, D. Ellison, R.M. Brown, R.P. Carnahan, M.O. Critchfield, C. Ng, M. Reyn Shah, F.L. Willingham, Jr.

Assistant Professors P. Ko, K. Khozeimeh *(Research)*, R.K-C. Kao *(Re* P.K. Poulose *(Research)*, I.S. Raju *(Research)*, S. Sae-Ung *(Research*

Assistant Professorial Lecturers I.E. Beckwith, R.L. Bowles, J.B. Ro R.C. Montgomery, D. Mulville, W.J. Boettinger, H.L. Beach, Jr., D endorf, G.D. Walberg, D.L. Dwoyer, B.A. Stein, G.L. Smith, M. R. Lee, T.L. Walton, Jr., J. Tracy

Lecturer K. Steinhaus

CIVIL ENGINEERING—UNDERGRADUATE STUDY

Civil engineering encompasses those branches of engineering activ closely related to the control and improvement of our environment conditions of life. Study in this field prepares students for careers in th ning, design, and construction of buildings; bridges; roads; airp transportation systems; harbors; off-shore facilities; coastal protec tures; flood and pollution control systems for rivers, estuaries, and lakes navigation systems; large power generation and flood control dams;

rces projects; urban renewal and development projects; and pollution con- and waste disposal projects. It also provides the scientific and technological kground required for careers in municipal engineering, urban and regional ning, and environmental and geotechnical civil engineering; and for careers engineering research in structural mechanics, ocean engineering, and ma- s engineering.

he curriculum provides the essentials for beginning a career upon gradua- for registration as a professional civil engineer as required by law, and for inuing study at the graduate level.

ing Classes

esponse to requests from those employed full time in the Washington, D.C., who wish to obtain a Bachelor of Science degree in Civil Engineering in asonable period of time, evening classes in the Civil Engineering curricu- are scheduled on a regular basis. For example, if a part-time student en- for three courses a semester, B.S. degree requirements can be completed ss than 15 semesters.

e Curriculum

mally the first four semesters are common to all undergraduate fields in the ool of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
th 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
sh 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)

nsfer students who have not successfully completed a college-level calculus course with a grade or better from an accredited institution, or high school students who did not take an advanced ment AP calculus course and receive a score of 4 or 5 on the AP test, will be required to ometry and graphs. Students who do not place directly into Math 31 as a result of this test ered to undertake a combined pre-calculus and calculus course (Math 30–31) during their ter this combined course meets five hours per week and carries three semester hours of the student successfully completes the second half (Math 31) of the combined course.

th 32 and Math 33 may be taken in a one-semester combined course, Math 32–33.

ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3)
	(May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 120:	Introduction to Mechanics of Solids (3)
CE 140:	Materials Science (3)
Phys 16:	Introduction to Modern Physics (3)

Civil Engineering Curriculum

Fifth Semester

CE 110:	Introduction to Environmental Engineering (3)
CE 121:	Structural Theory I (3)
CE 166:	Materials Engineering (2)
CE 167:	Mechanics of Materials Laboratory (1)
ME 131:	Thermodynamics (3)
Elective:	Selected from humanities or social sciences (6)

Sixth Semester

CE 122:	Structural Theory II (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
CE 192:	Reinforced Concrete Structures (3)
Geol 136:	Engineering Geology (3)
ME 126:	Fluid Mechanics (3)
Elective:	Selected from humanities or social sciences (3)

Seventh Semester

CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 194:	Environmental Engineering I: Water Supply and Resources
CE 195:	Hydrology (3)
Elective:	Technical electives (3)

Eighth Semester

CE 182:	Foundation Engineering (2)
CE 185:	Soil Mechanics and Foundation Engineering Laboratory (1)
CE 196:	Design and Cost Analysis of Civil Engineering Structures
CE 197:	Environmental Engineering II: Waste and Pollution Control
Elective:	Technical electives (5)

Technical Electives

CE 198:	Research (3)
CE 201:	Design of Metal Structures (3)
CE 202:	Design of Reinforced Concrete Structures (3)

CE 203: Prestressed Concrete Structures (3)
CE 204: Applied Soil Mechanics I (3)
CE 206: Foundation Engineering (3)
CE 208: Rock Mechanics (3)
CE 210: Methods of Structural Analysis (3)
CE 212: Open Channel Flow (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)
CE 220: Urban Transportation Engineering (3)
CE 222: Stations and Terminals (3)
CE 223: Traffic Engineering (3)
CE 240: Environmental Microbiology (3)
CE 241: Environmental Chemistry (3)
CE 243: Environmental Impact Assessment (3)
CE 253: Failure and Reliability Analysis of Engineering Structures (3)
CE 255: Coastal Processes (3)
CE 266: Design Procedures for Earthquakes (3)
CE 282: Hydraulic Modeling (3)
EAd 150: Introduction to Engineering Administration (3)
EngS 215: Advanced Strength of Materials (3)
EngS 234: Composite Materials (3)
EngS 242: Materials Recycling and Recovery (3)
EngS 282: Computer-aided Design (3)



Geotechnical Civil Engineering Option

Geotechnical civil engineering encompasses engineering problems in soil mechanics, foundation engineering, rock mechanics, and geologic pects of engineering. More specifically, planning, designing, and erecting tures founded on or made of soil and rock constitute the main features branch of civil engineering. Included are the design and construction of tions for all types of buildings, bridges, and highway and airfield pav design and construction of earth- and rock-fill dams, embankments, wat structures, tunnels, and drainage facilities; and stabilization procedur reclamation of marginal lands. Engineering geology, which is the applica geological data, principles, and interpretations to naturally occurring ea rock masses, constitutes an important part in the planning and design st civil engineering structures of the above type. The Geotechnical Civil Eng ing Option provides the student with the fundamentals for subsequent and development in this branch of civil engineering.

CURRICULUM

Prerequisite: first four semesters as described in the Core Curriculum page 59, with the following changes:

Third semester: *Geology 21 *Physical and Evolutionary Geology* taken instead of the elective.

Fourth semester: *Geology 122 *Structural Geology* will be taken in CE 120: *Introduction to the Mechanics of Solids.* A 3-credit elective social sciences or humanities should also be taken at this time.

Fifth Semester

CE 120:	Introduction to the Mechanics of Solids (3)
CE 121:	Structural Theory I (3)
ME 131:	Thermodynamics (3)
CE 166:	Materials Engineering (2)
CE 167:	Mechanics of Materials Laboratory (1)
Elective:	Selected from humanities or social sciences (3)

Sixth Semester

CE 122:	Structural Theory II (3)
ME 126:	Fluid Mechanics (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
CE 192:	Reinforced Concrete Structures (3)
*Geol 128:	Geomorphology (3)
*Geol 136:	Engineering Geology (3)

Seventh Semester

CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 195:	Hydrology (3)
*Geol 163:	Sedimentation (4)
*Geol 189:	Geophysics for Geologists (3)

* For course descriptions, see the *Undergraduate and Graduate Bulletin.*

Eighth Semester

CE 182: Foundation Engineering (2)
CE 185: Soil Mechanics and Foundation Engineering Laboratory (1)
CE 204: Applied Soil Mechanics I (3)
*Geol 195: Field Work (2)
Electives: Selected from humanities or social sciences (6)

Civil Engineering Undergraduate Courses

110 Introduction to Environmental Engineering (3)

An introductory study of environmental resources and their uses. Aspects considered will include water resource systems; air and water quality; solid waste and wastewater disposal systems; noise pollution; treatment processes; environmental impact analysis and environmental planning. Prerequisite: Chem 13. (Fall)

120 Introduction to the Mechanics of Solids (3)

Three-dimensional strain and stress. Constitutive equations for elastic, viscoelastic, and plastic materials. Axial load, bending and torsion of struts and beams. Instability and failure. Prerequisite: ApSc 57, 113. (Fall and spring)

121–22 Structural Theory I-II (3–3)

Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall and spring)

140 Materials Science (3)

Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; transport phenomena—thermal conductivity, electrical conduction; metals, insulators, semiconductors; magnetism. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and spring)

166 Materials Engineering (2)

Mechanical properties and their description; effect of microstructure on the mechanical behavior of metals, ceramics, polymers, and polyphase materials; effect of strain-rate and temperature; creep, fatigue, and fracture; effect of surface and environment; materials evaluation for structural performance. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and spring)

167 Mechanics of Materials Laboratory (1)

Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and spring)

168 Introductory Soil Mechanics (3)

Engineering properties of soils: analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

*New course descriptions, see the *Undergraduate and Graduate Bulletin*.

182 Foundation Engineering (2)

Subsurface exploration, design of shallow foundations, design foundations, earth-retaining structures. Prerequisite: CE 168.

185 Soil Mechanics and Foundation Engineering Laboratory (1)

Laboratory experiments for the classification, strength, compr and general engineering properties of soils. Prerequisite: CE (Spring)

190 Legal and Economic Aspects of Engineering (2)

Laws relating to engineering practice, preparation of contract do and specifications, consideration of economic factors in engineering decisions. (Spring)

191 Metal Structures (3)

Principles of the design of metal structures; structural elements; tions; specific problems of analysis; methods of construction. Prer CE 122. (Fall)

192 Reinforced Concrete Structures (3)

Principles of the design of reinforced concrete structures. Details forcement of structural elements. Monolithic structures, precast e methods of construction. Prerequisite: CE 121. (Spring)

193 Hydraulics (3)

Fluid statics: applications to calculation of boundary forces in fluid, buoyancy, and flotation. Application of kinematic princ fields, stream tubes, and flow nets. Fluid dynamics: applications flow, hydraulic models, measurement of pressure, and velocity channel flow: applications to water resources engineering. Prer ME 126. (Fall)

194 Environmental Engineering I: Water Supply and Resources (3)

Planning and design of water supply and waste-water disposal s Water quality control and treatment processes. Desalination, pollution control. Prerequisite or concurrent registration: CE 19 (Fall)

195 Hydrology (3)

Descriptive hydrology: hydrologic cycle, precipitation, stream flow oration, and transpiration. Quantitative hydrology: hydrograph a estimating volume of runoff, runoff from snow, hydrographs of h flow, storage routing. Probability concepts in hydrology: flood fre rainfall frequency, drought, stochastic hydrology. Prerequisite o current registration: ApSc 115, ME 126, CE 193. (Fall)

196 Design and Cost Analysis of Civil Engineering Structures (3)

Design of civil engineering structures such as wharves, piers, tunnels, dams, bridges, water treatment, and drainage systems. site: senior status. (Spring)

197 Environmental Engineering II: Waste and Pollution Control (3)

Disposal of sewage, biological treatment, chemical treatment, activated sludge, sludge handling and disposal. Control of wastes and of nuclear waste products. Solid waste disposal. Pre CE 193. (Spring)

198 **Research** (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

ECHANICAL ENGINEERING—UNDERGRADUATE STUDY

echanical engineering is primarily concerned with physical systems in mo-on. A mechanical engineer is concerned with the conversion, transfer, and ntrol of energy from its source to its moving system. Land and marine ve-cles, transportation systems, air-conditioning systems, nuclear reactors and el cells, low-pollution control devices, energy resources and the means of prac-l and economical conversion of the various forms of energy to mechanical d electrical power, and a host of other devices lie in this domain. Training this area should provide the ability to formulate problems based on funda-ental laws of nature, to recognize the types of methods which are applicable their solution, to read with understanding the relevant work, and to come with a usable answer. The mechanical engineering curriculum provides a ckground for careers in research, design, development, and manufacture in wide variety of industries.

Course offerings in mechanical engineering, which begin with a broad ndation in physics, chemistry, mathematics, humanities, and social sciences, nsist of studies in basic mechanics of solids and fluids, electricity and ctronics, material sciences, dynamic analysis, thermal sciences, energy con-sion and power, environmental control, and the design of machines and tems and their control. Technical electives in the senior year allow students erested in computers to select an option which will prepare them for careers computing as well as graduate study in computer-dominated or computer-ented professional fields. The program outlined below is based on the con-t that the mechanical engineer must be prepared to meet the challenge of increasing technical, economic, and social problems.

Graduates are qualified for professional positions in design, analysis, manu-cture, and application of machines, process, and control, or in research and elopment, as well as for graduate work.

ning Classes

response to requests from those employed full time in the Washington, D.C., a who wish to obtain a Bachelor of Science degree in Mechanical Engineer-in a reasonable period of time, evening classes in the Mechanical Engineer-curriculum are scheduled on a regular basis. For example, if a part-time dent enrolls for three courses a semester, B.S. degree requirements can be pleted in less than 15 semesters.

ior Year Abroad Program

School of Engineering and Applied Science and the Institute of Sound and ration Research of the University of Southampton, England, have estab-ed an exchange program so that graduate students in acoustics at both insti-ons may transfer academic credits to either University in fulfillment of the

requirements for advanced degrees. A special arrangement has now b
to extend the graduate exchange program to the undergraduate level
some mechanical engineering students to spend the junior year abro

The program furthers a student's particular academic interests in
engineering and develops knowledge of world affairs in general,
national technical fields in particular.

Applicants must apply for admission to the Junior Year Abroad p
the Department Chairman before the end of the fall semester of the
year. Approval must be given by the Department Chairman and the
the School of Engineering and Applied Science.

Core Curriculum

Normally the first four semesters are common to all undergraduate fie
School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 140:	Materials Science (3)
EE 11:	Linear Networks I (3)

* Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30-31) during the first semester; this combined course meets five hours per week and carries three semester credit if the student successfully completes the second half (Math 31) of the course.

† Math 32 and Math 33 may be taken in a one-semester combined course, Math 32-33.

Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3)
(May be taken during the Summer Sessions)

echanical Engineering Curriculum

Fifth Semester

CE 120: Introduction to the Mechanics of Solids (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

EE 20: Introductory Engineering Electronics (3)
EE 172: Control Systems (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics (3)
ME 148: Thermodynamic Analysis (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

ME 155: Compressible Fluid Flow (3)
ME 187: Heat Transfer Theory (3)
ME 190: Mechanisms, Analysis, and Synthesis (3)
ME 191: Mechanical Design (3)
Elective: Technical electives (6)

Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 193: Engineering Systems Design (3)
ME 194: Energy Conversion (3)
Elective: Technical electives (6)

Technical Electives

CE 197: Environmental Engineering II: Waste and Pollution Control (3)
EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EngS 215: Advanced Strength of Materials (3)
*ME 176: Environmental Engineering Problems (3)
ME 192: Product Design and Process Engineering (3)
ME 215: Theory of Vibrations (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 240: Kinematic Synthesis (3)
ME 247: Fluidics (3)

Technical Electives for Computer-oriented Mechanical Engineering Option

CSci 278: Analog and Hybrid Computers (3)
EE 152: Introduction to Digital Computers (3)
EE 157: Machine and Assembly Language Programming (3)

ired course which must be selected from the technical electives.

EngS 282: Computer-aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
*ME 176: Environmental Engineering Problems (3)

Technical Electives for Energy Resources and Pow
Mechanical Engineering Option

EE 177: Electrical Energy Conversion (3)
EngS 208: Energy Conservation (3)
EngS 214: Geothermal Energy (3)
*ME 176: Environmental Engineering Problems (3)
ME 224: Fundamentals of Combustion Engines (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 259: Solar Heating and Cooling of Buildings (3)
ME 260: Heating and Air Conditioning of Buildings (3)
ME 283: Nuclear Reactor Engineering I (3)
ME 294: Wind Energy (3)

Mechanical Engineering Undergraduate Courses

120 Methods of Engineering Experimentation (2)

Acquisition and analysis of experimental data. Laws of mod simulation. Report formulation and presentation. Basic princip rious measuring instruments and sensors. Laboratory experimen ing use of strain gages, oscilloscopes, various tranducers, etc. In to basic experimental techniques related to dynamics, fluid thermal sciences. Prerequisite: CE 120, ME 131. (Spring)

126 Fluid Mechanics (3)

Fluid properties, regimes in fluid mechanics, fluid statics, fluid ki basic equations, one- and two-dimensional inviscid incompress viscous incompressible flow, dimensional method. Prerequisite: (Spring)

131 Thermodynamics (3)

Fundamental thermodynamic concepts, Zeroth law of thermo and temperature measurements, work and heat, first law of th namics, properties of pure substances, first-law analysis of open dynamic systems, second law of thermodynamics, reversibility second-law analysis of thermodynamic systems. Prerequisite or co registration: ApSc 58. (Fall)

134 Introduction to Vibration Analysis (3)

Natural frequencies and response of single- and multiple-degree dom mechanical systems to dynamic loads. Effect of damping and steady-state analysis. Prerequisite: ApSc 58. (Fall)

148 Thermodynamic Analysis (3)

Analysis of thermodynamic power and refrigeration cycles; namics of mixtures of substances; properties of air-water vapor psychrometry and analysis of cooling tower and air-conditioning third law of thermodynamics and absolute entropy; evaluation of tion processes. Molecular distributions and models; introduction

* Required course which must be selected from the technical electives.

tistical and quantum mechanics; statistical thermodynamics and thermodynamic properties of gases and solids. Prerequisite: ME 131. (Spring)

152 **Mechanical Engineering Laboratory** (2)

Experimental study of various engineering systems. Laboratory projects include experimental design, modeling and simulation parameters, data acquisition, and report presentation techniques. Prerequisite: ME 120. (As arranged)

155 **Compressible Fluid Flow** (3)

Introduction to compressible flow, basic equations, propagation of motion in compressible fluids, isotropic-flow relations, steady one-dimensional flow, wave phenomena, small perturbation theory, slender-body theory, method of characteristics. Prerequisite: ME 126, 131. (Fall)

176 **Environmental Engineering Problems** (3)

Classification and effects of air pollutants; air-quality criteria and standards; analysis of pollutants; sources of pollutants and emission inventory; emission-control equipment. Water-quality standards; sewage and industrial waste characterization and pollutional effects in natural waters; primary, biological, and tertiary treatment of wastes; sludge handling and disposal. Prerequisite: senior status. (Fall)

187 **Heat Transfer Theory** (3)

Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective-heat transfer. Evaluation of convective-heat transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative-heat transfer between surfaces. Design considerations; heat-exchanger design and selection. Prerequisite: ME 126. (Fall)

190 **Mechanisms, Analysis, and Synthesis** (3)

Kinematics and dynamics of mechanisms. Displacement, velocities, accelerations in linkage and cam systems by analytical and graphical methods. Prerequisite: ApSc 58. (Fall)

191 **Mechanical Design** (3)

Introduction to design concept, selection of materials, and strength of mechanical elements; design of machine components such as shafts, springs, bearings, gears, couplings, screws, and related mechanical components. Prerequisite: senior status. (Fall)

192 **Product Design and Process Engineering** (3)

Introduction to product design and to modern manufacturing techniques. Functional, technological, and economic considerations, such as production volume, energy and materials consumption, and labor. Criteria for product acceptance, cost, and other factors. Properties and behavior of metals and polymers. Capabilities and limitations of various basic and secondary processes and their influence on product design. Prerequisite: senior status. (Spring)

193 **Engineering Systems Design** (3)

Creative engineering design, problem definition, and concept generation. Familiarization with standard machine components. Practice in integrat-

ing a variety of core disciplines via system design projects. Vi
ing, graphical communication, analysis and optimization
Creative solutions to current, real engineering design problem
projects may integrate with ME 152 Mechanical Engineering L
projects. Prerequisite: ME 191. (Spring)

194 **Energy Conversion** (3)
Energy resources of the earth; energy, society, and the national
issue of energy and the environment, future outlook for ener
and demand. Conversion of energy; fundamental principles an
logical options, efficiency of different energy converters. Curr
nologies and longer-range possibilities. Generation of electricit
in the electricity industry; nuclear power systems—growth, econo
environmental impacts. Unconventional methods of power gener
rect energy conversion. Prerequisite: EE 20, ME 148. (Spri

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged.
site: junior or senior status. (Fall and spring)

ENGINEERING SCIENCE—UNDERGRADUATE COURSE

4 **Descriptive Geometry and Drafting** (3)
Introductory descriptive geometry. Use of equipment. Points
curves, planes, and surfaces; principal, auxiliary, and orthographic
isometric views, intersection of surfaces. Technical sketching, dim
and precision, machine elements. Detail and assembly drawings
tural elements. Layout and fabrication drawings, pipe and electrical
(Spring)

GRADUATE STUDY

Developments in science and technology in the decades to come req
the engineer be thoroughly grounded in fundamentals as well as in
emerging technological and scientific disciplines. The modern engine
also master techniques in analysis, computation, design, and synthesis
the proliferation of knowledge and technological specialty, the Depart
heres to the principle that versatility and depth in scientific fundamentals
be the characteristic features of any graduate program that attempts to
the student to cope with engineering developments.

The Department of Civil, Mechanical, and Environmental Engineering
graduate programs in the various areas of concentration on three degree
the Master of Science degree, the Professional degree, and the Doctor of
degree.

The Doctor of Science degree is offered in the following areas: aer
aeronautics; energy; environmental engineering; fluid mechanics and
sciences; ocean, coastal, and marine engineering; solid mechanics and
engineering; structural engineering; structures and dynamics; transpor
gineering (except Option III which is for the M.S. and Professional
only); and water resources (except Option II, water resources planning
is for the M.S. degree only).

The Master of Science and the Professional degrees are offered in all of the aforementioned areas and in the following areas: computer-aided design, environmental modeling, geotechnical engineering, mechanical engineering design, and public works engineering.

Courses for these specializations are listed on subsequent pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science, as well as from other schools and divisions of the University. Depending upon the interest of the student, some of the programs leading to the degrees of Master of Science and, by special permission of the appropriate department chairman, Doctor of Science degrees are given at the NASA-Langley Research Center, Hampton, Virginia. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

Each program is arranged to fit the student's individual needs and interests and utilize previous experience and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests, enabling a close student-faculty relationship to develop during the course of the program.

Fields and Areas of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas.

ACOUSTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
*EngS 203–4: Special Topics in Engineering Analysis
EngS 217: Probability and Statistics of Metrology
EngS 270: Analytical Mechanics
*EngS 271: Theoretical Acoustics I
*EngS 272: Random Process Theory I
*EngS 273: Random Process Theory II
EngS 274: Time Series Analysis
*EngS 275: Environmental Noise Control
*EngS 276: Theoretical Acoustics II
*EngS 277: Acoustical and Mechanical Measurements
*EngS 278: Physical Acoustics
*EngS 279: Psychological and Physiological Acoustics
*EngS 280: Human Factors in Engineering
EngS 298: Special Topics in Acoustics
EngS 299–300: Research
*EngS 310: Thesis Research
*EngS 311: Aeroacoustics
*EngS 312: Nonlinear Acoustics
*EngS 313: Theory of Random Vibration
EngS 398: Structural Acoustics Interaction
EngS 399: Advanced Reading and Research
Dissertation Research

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 312: Theory of Turbulence

AERONAUTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
EE 202: Linear System Theory I
EngS 217: Analytical Mechanics
EngS 284: Numerical Methods in Engineering
ME 215: Theory of Vibrations
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I
*ME 248: Seminar: Aircraft Design I
*ME 249: Seminar: Aircraft Design II
*ME 270: Applied Fluid Dynamics
*ME 271: VTOL Aircraft Technology
*ME 272: Powered-lift Technology
*ME 273: Principles of Automatic Flight Control
*ME 274: Principles of Flight Guidance
ME 275: Stability and Control of Vehicles
*ME 277: Numerical Methods in Fluid Mechanics
*ME 278: Performance, Stability, and Control of Helicopters
*ME 279: Special Topics in Flight Sciences
ME 281: Nonequilibrium Thermodynamics
*ME 290: Kinetic Theory of Gases
ME 295: Statistical Thermodynamics
ME 298: Research
ME 299–300: Thesis Research
ME 312: Theory of Turbulence
ME 315: Hypersonic Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

COMPUTER-AIDED DESIGN

ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 210: Methods of Structural Analysis
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells

* Offered at NASA-Langley Research Center; may be offered on campus when arranged

CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CSci 158: Algorithmic Methods and High-level Languages
CSci 201: Introduction to Computer Systems
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
CSci 227: Management Information Systems and Data Base Management
EngS 251–52: Transportation Workshop
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 247: Fluidics
ME 251: Advanced Electromechanical Control Systems

equired courses for MS Degree: ApSc 213, CSci 201, 213, 214, EngS 282, and Sci 219 or EngS 283.

ERGY

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
CE 243: Environmental Impact Assessment
EAd 221–22: Environmental Management
EAd 283: Systems Engineering I
EngS 206: Technology and Human Needs
EngS 207: Engineering Climatology
EngS 208: Energy Conservation
EngS 210: Quantitative Aspects of Social Phenomena
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 214: Geothermal Energy
EngS 242: Materials Recycling and Recovery
EngS 270: Theoretical Acoustics I
EngS 274: Environmental Noise Control
EngS 284: Numerical Methods in Engineering
ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I

ME 254:	Intermediate Heat and Mass Transfer
ME 257:	Energy Technology I
ME 258:	Energy Technology II
ME 259:	Solar Heating and Cooling of Buildings
ME 260:	Heating and Air Conditioning of Buildings
ME 261:	Air Pollution I
ME 262:	Air Pollution II
ME 263:	Air Pollution Control Technology
ME 264:	Air Pollution Seminar
ME 265:	Air Pollution Meteorology
ME 280:	Intermediate Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 282:	Fossil Fuels
ME 283:	Nuclear Reactor Engineering I
ME 284:	Nuclear Reactor Engineering II
ME 287:	Heat Conduction
ME 290:	Kinetic Theory of Gases
ME 291–92:	Power Systems
ME 293:	Combustion
ME 294:	Wind Energy
ME 298:	Research
ME 299–300:	Thesis Research
ME 312:	Theory of Turbulence
ME 313:	Magnetofluidmechanics
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research
OR 201:	Survey of Operations Research Methods

Required courses for Degree Programs in Energy Technology (Option 1): MS— 211, 213, ME 221, 254, 257, 258, 280; Professional Degree—EngS 284, ME [illegible] DSc—ApSc 212, 215 and ME 281.

Required courses for Degree Programs in Energy Systems (Option 2): MS— 213, ME 257, 258, 261, and OR 201; Professional Degree—EngS 284 and [illegible]

ENVIRONMENTAL ENGINEERING

Option I: Water and Wastewater Engineering

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
CE 211:	Physical Chemical Wastewater Treatment
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 216:	Advanced Hydrology
CE 219:	Groundwater and Seepage
CE 237:	Advanced Sanity Engineering Design
CE 240:	Environmental Microbiology
CE 241:	Environmental Chemistry
CE 242:	Solid Waste Disposal
CE 243:	Environmental Impact Assessment
CE 272:	Biological Wastewater Treatment
CE 273:	Water Supply Engineering
CE 276:	Water Resources Planning and Control

CE 277: Industrial Waste Treatment
CE 278: Pollutant Transport
CE 279: Unit Operations in Environmental Engineering
CE 280: Water Resources Systems
CE 298: Research
CE 299–300: Thesis Research
EngS 242: Materials Recycling and Recovery
ME 221: Intermediate Fluid Mechanics
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 263: Air Pollution Control Technology

equired courses for MS Degree: CE 211, 212, 240, 241, 272, 273.

equired courses for DSc Degree: ApSc 211, 213, CE 278, 279.

Option II: Air Pollution Engineering

ApSc 211: Analytical Methods in Engineering I
or
EngS 284: Numerical Methods in Engineering
ApSc 213: Analytical Methods in Engineering III
CE 211: Physical Chemical Wastewater Treatment
CE 240: Environmental Microbiology
CE 241: Environmental Chemistry
CE 272: Biological Wastewater Treatment
EAd 221–22: Environmental Management
EngS 207: Engineering Climatology
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 270: Theoretical Acoustics
EngS 274: Environmental Noise Control
ME 204: Advanced Instrumentation Techniques
ME 215: Theory of Vibrations
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engineering
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 257–58: Energy Technology
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 263: Air Pollution Control Technology
ME 264: Air Pollution Seminar
ME 265: Air Pollution Meteorology
ME 282: Fossil Fuels
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 291–92: Power Systems
ME 293: Combustion
ME 312: Theory of Turbulence

equired courses for MS Degree: ApSc 211 or EngS 284, ApSc 213, ME 221, 288, 1, 263.

ENVIRONMENTAL MODELING†

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
*EngS 263:	Atmospheric Physics for Engineers I
*EngS 264:	Atmospheric Physics for Engineers II
EngS 284:	Numerical Methods in Engineering
EngS 298:	Research
EngS 299–300:	Thesis Research
EngS 314:	Advanced Numerical Methods in Engineering
ME 221:	Intermediate Fluid Mechanics
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 257:	Energy Technology I
ME 265:	Air-pollution Meteorology
ME 285:	Reaction Kinetics
ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 296:	Special Topics in Heat and Mass Transfer
ME 312:	Theory of Turbulence

FLUID MECHANICS AND THERMAL SCIENCES

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
CE 274:	Mechanics of Water Waves
EE 133:	Electromagnetic Waves
EE 236:	Plasma Dynamics
EngS 218:	Introduction to Continuum Mechanics
EngS 289:	Special Topics in Theoretical and Applied Mechanics
EngS 315:	Introduction to Nonlinear Mechanics of Continua
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 235:	Compressible Flow
ME 277:	Numerical Methods in Fluid Mechanics
ME 280:	Intermediate Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 282:	Fossil Fuels
ME 287:	Heat Conduction
ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 295:	Statistical Thermodynamics
ME 297:	Special Topics in Fluid Mechanics
ME 298:	Research
ME 299–300:	Thesis Research
ME 310:	Mechanics of Non-Newtonian Fluids

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 311: Nonsteady Flow
ME 312: Theory of Turbulence
ME 313: Magnetofluidmechanics
ME 315: Hypersonic Flow
ME 317: Physical Gas Dynamics
ME 398: Advanced Reading and Research
ME 399: Dissertation Research

equired courses for MS Degree: ApSc 211, 213, ME 221, 280 (also ME 227 for
on-thesis students); for Professional and DSc Degrees: Fluid Mechanics—ApSc 212
214 or 216, 215, ME 231, 288, 311, 312; Thermal Sciences—ApSc 212 or 214 or
6, 215, ME 235, 288, 287, 289.

OTECHNICAL ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 208: Rock Engineering
CE 209: Theoretical Soil Mechanics
CE 210: Methods of Structural Analysis
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 219: Groundwater and Seepage
CE 221: Pavement and Runway Design
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 265: Special Topics in Geotechnical Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 256: Introduction to the Theories of Inelastic Media
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
*Geol 128: Geomorphology
*Geol 189: Geophysics for Geologists
*Geol 224: Advanced Structural Geology

quired courses for MS Degree: ApSc 211 or 213, CE 204, 205, 206 and EngS 285.
r Professional Degree: CE 207, 208, 219, and EngS 221.

r course descriptions, see the *Undergraduate and Graduate Bulletin*.

MECHANICAL ENGINEERING DESIGN

ApSc 213:	Analytical Methods in Engineering III
CE 253:	Failure and Reliability Analysis of Engineering Structures
EngS 215:	Advanced Strength of Materials
EngS 251–52:	Transportation Workshop
EngS 282:	Computer-aided Design
EngS 283:	Application of Computer Graphics in Engineering
ME 215:	Theory of Vibrations
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 225:	Turbomachinery I
ME 226:	Turbomachinery II
ME 240:	Kinematic Synthesis
ME 241:	Engineering Systems Design
ME 242:	Advanced Mechanisms
ME 243:	Advanced Mechanical Engineering Design
ME 246:	Electromechanical Control Systems
ME 247:	Fluidics
ME 251:	Advanced Electromechanical Control Systems
ME 298:	Research
ME 299–300:	Thesis Research

Required courses for MS Degree: ApSc 213, ME 241, 243, 246.

OCEAN, COASTAL, AND MARINE ENGINEERING

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
CE 203:	Prestressed Concrete Structures
CE 206:	Foundation Engineering
CE 208:	Rock Engineering
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 216:	Advanced Hydrology
CE 219:	Groundwater and Seepage
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 255:	Coastal Processes
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 265:	Special Topics in Geotechnical Engineering
CE 274:	Mechanics of Water Waves
CE 275:	Special Topics in Ocean Engineering
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
CE 312:	Advanced Hydraulics
CE 398:	Advanced Reading and Research

CE 399: Dissertation Research
EngS 228: Physical Oceanography
EngS 260: Random Process Theory in Engineering
EngS 273: Time Series Analysis
*Geol 181: General Oceanography
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 297: Special Topics in Fluid Mechanics
ME 312: Theory of Turbulence

Required courses for degree programs in Hydromechanics: MS—ApSc 211, 213, EngS 260, and ME 221; DSc—ApSc 212, 214, 215, CE 274, ME 227, 312, 231.

Required courses for degree programs in Ocean, Coastal, and Marine Engineering: MS—ApSc 211, 213, EngS 260 and ME 221; DSc—ApSc 212, 215, CE 256, 274, ME 231, and ME 215 or EngS 273.

PUBLIC WORKS ENGINEERING

CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 208: Rock Engineering
CE 211: Physical and Chemical Wastewater Treatment
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 215: Urban Construction Technology
CE 216: Advanced Hydrology
CE 217: Water Resources Engineering
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 223: Traffic Engineering
CE 237: Advanced Sanitary Engineering Design
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 276: Water Resources Planning and Control
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels

*For course descriptions, see the *Undergraduate and Graduate Bulletin.*

EAd 204:	Administration of Engineering Contracts
EAd 210:	Engineering Law
EAd 241:	Construction Management I
EAd 242:	Construction Management II
EAd 243:	Construction Management III
EAd 261:	Economic Analysis in Engineering Planning
EngS 284:	Numerical Methods in Engineering
OR 201:	Survey of Operations Research Methods

Required courses for MS Degree: CE 202, 206, 220, 243, 276, and EAd 24
243; for Professional Degree: CE 211 or 217 or 223, EngS 284 or OR 20
additional course from the sequence EAd 241, 242, 243.

SOLID MECHANICS AND MATERIALS ENGINEERING

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
CE 207:	Soil Dynamics
CE 209:	Theoretical Soil Mechanics
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 254:	Special Topics in Structural Engineering
CE 261:	Analysis of Plates and Shells
CE 263:	Theory of Structural Stability
EngS 215:	Advanced Strength of Materials
EngS 217:	Analytical Mechanics
EngS 218:	Introduction to Continuum Mechanics
EngS 221:	Theory of Elasticity I
EngS 222:	Theory of Elasticity II
EngS 229:	Transformations in Materials
EngS 230:	Deformation of Materials
EngS 231:	Structure of Materials
EngS 233:	Mechanics of Composite Materials
EngS 234:	Composite Materials
EngS 236:	Experimental Techniques in Materials Science
EngS 237:	Environmental Effects on Materials I
EngS 238:	Environmental Effects on Materials II
EngS 240:	Fracture Mechanics
EngS 241:	Failure of Materials
EngS 242:	Materials Recycling and Recovery
EngS 249:	Special Topics in Materials Science
EngS 256:	Introduction to the Theories of Inelastic Media
EngS 259:	Random Vibration of Structures
EngS 284:	Numerical Methods in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
EngS 288:	Advanced Finite Element Methods in Structural Mechanics
EngS 289:	Special Topics in Theoretical and Applied Mechanics
EngS 298:	Research
EngS 299–300:	Thesis Research
EngS 315:	Introduction to Nonlinear Mechanics of Continua
EngS 398:	Advanced Reading and Research
EngS 399:	Dissertation Research
ME 215:	Theory of Vibrations

ME 216: Structural Dynamics
ME 221: Intermediate Fluid Mechanics
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 295: Statistical Thermodynamics
ME 310: Mechanics of Non-Newtonian Fluids

quired courses for degree programs in Solid Mechanics: MS—ApSc 211, 213, EngS 221; Professional Degree—EngS 222, 240, 241, 256, 285; DSc—ApSc 212, 215, S 222, 233, 256, 315.

quired courses for degree programs in Materials Engineering: MS—ApSc 211, EngS 229, 231; Professional Degree—EngS 230, 234, 237, 240, 241; DSc—ApSc EngS 229, 230, 231, 240, 256.

RUCTURAL ENGINEERING

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 210: Methods of Structural Analysis
CE 215: Urban Construction Technology
CE 250: Advanced Metal Structures
CE 251: Advanced Reinforced Concrete Structures
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 261: Analysis of Plates and Shells
CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CE 266: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267: Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CE 298: Research
CE 299–300: Thesis Research
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 215: Advanced Strength of Materials
EngS 221: Theory of Elasticity I
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 240: Fracture Mechanics
EngS 241: Failure of Materials
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures

EngS 282:	Computer-aided Design
EngS 283:	Application of Computer Graphics in Engineering
EngS 284:	Numerical Methods in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
EngS 288:	Advanced Finite Element Methods in Structural Mechanics

Required courses for degree programs: MS—ApSc 213, CE 201 or 202, CE 210, EngS 215, 284; Professional—CE 250 or 251, CE 252 or 253, CE 262, and EngS 282 or 288; DSc—ApSc 212, 213 or 214, CE 252, 254, EngS 221, 288.

STRUCTURES AND DYNAMICS*

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 254:	Special Topics in Structural Engineering
CE 261:	Analysis of Plates and Shells
CE 263:	Theory of Structural Stability
EE 157:	Machine and Assembly Language Programming
EngS 221:	Theory of Elasticity I
EngS 222:	Theory of Elasticity II
EngS 234:	Composite Materials
EngS 259:	Random Vibration of Structures
*EngS 281:	Advanced Programming Techniques for Engineering Mechanics Problems
EngS 282:	Computer-aided Design
EngS 283:	Application of Computer Graphics in Engineering
EngS 284:	Numerical Methods in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
*EngS 286:	Analysis and Design of Thin-walled Structures
*EngS 287:	Automated Design of Complex Structures
EngS 288:	Advanced Finite Element Methods in Structural Mechanics
EngS 289:	Special Topics in Theoretical and Applied Mechanics
EngS 299–300:	Thesis Research
EngS 314:	Advanced Numerical Methods in Engineering
EngS 398:	Advanced Reading and Research
EngS 399:	Dissertation Research
ME 215:	Theory of Vibrations
ME 216:	Structural Dynamics
ME 223:	Aeroelasticity
*ME 248:	Seminar: Aircraft Design I
OR 251:	Linear Programming
OR 252:	Nonlinear Programming

TRANSPORTATION ENGINEERING

Option I: Technology of the Vehicle

ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

CE 201: Design of Metal Structures
CE 210: Methods of Structural Analysis
CE 220: Urban Transportation Engineering
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 221: Theory of Elasticity I
EngS 241: Failure of Materials
EngS 251–52: Transportation Workshop
EngS 253: Control of Automated Transit Networks
EngS 259: Random Vibration of Structures
EngS 260: Random Process Theory in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 241: Engineering Systems Design
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 250: Design of Complex Systems
ME 251: Advanced Electromechanical Control Systems
ME 255–56: Urban Transportation Technology
ME 275: Stability and Control of Vehicles
ME 286: Special Topics in Mechanical Engineering
ME 293: Combustion
ME 298: Research
ME 299–300: Thesis Research
ME 311: Nonsteady Flow
ME 398: Advanced Reading and Research
ME 399: Dissertation Research
*U&RP 208: Urban Transportation Planning
*U&RP 209: Urban Transportation Models

Required courses for MS Degree: (Mechanical)—CE 220, EngS 251, ME 221, 237; (Structural)—CE 210, 220, 252 and EngS 251.
For DSc Degree: (Mechanical)—ApSc 213, 215, ME 293 and ME 238 or 311; (Structural)—ApSc 213 or 214, CE 252, EngS 285, 288, 221 or 315.

Option II: The Way (Route Structures and Facilities)

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV

* For course descriptions, see the *Undergraduate and Graduate Bulletin*.

CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 204:	Applied Soil Mechanics I
CE 205:	Applied Soil Mechanics II
CE 206:	Foundation Engineering
CE 207:	Soil Dynamics
CE 209:	Theoretical Soil Mechanics
CE 210:	Methods of Structural Analysis
CE 220:	Urban Transportation Engineering
CE 221:	Pavement and Runway Design
CE 222:	Stations and Terminals
CE 223:	Traffic Engineering
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
EngS 221:	Theory of Elasticity I
EngS 240:	Fracture Mechanics
EngS 241:	Failure of Materials
EngS 251–52:	Transportation Workshop
EngS 253:	Control of Automated Transit Networks
EngS 259:	Random Vibration of Structures
EngS 285:	Finite Element Methods in Engineering Mechanics
EngS 288:	Advanced Finite Element Methods in Structural Mechanics
EngS 298:	Research
EngS 299–300:	Thesis Research
EngS 315:	Introduction to Nonlinear Mechanics of Continua
EngS 398:	Advanced Reading and Research
EngS 399:	Dissertation Research
ME 255–56:	Urban Transportation Technology
OR 231:	Theory of Traffic Flow
*U&RP 208:	Urban Transportation Planning
*U&RP 209:	Urban Transportation Models

Required courses for degree programs: MS—CE 201 or 202, 210, 220, 221 or 223, and EngS 251; DSc—ApSc 212, 213 or 214, CE 252, EngS 285, 288, and EngS 221 or 315.

Option III: Transportation Systems†

CE 220:	Urban Transportation Engineering
CE 223:	Traffic Engineering
CE 243:	Environmental Impact Assessment
EAd 261:	Economic Analysis in Engineering Planning
EAd 265:	Transportation Management I
EAd 266:	Transportation Management II
EAd 281–82:	Systems Analysis and Management
EngS 251–52:	Transportation Workshop
EngS 253:	Control of Automated Transit Networks
ME 255–56:	Urban Transportation Technology
ME 298:	Research

* For course descriptions, see the *Undergraduate and Graduate Bulletin*.
† Prerequisite courses for admission to this option are ApSc 115 and Stat 191 (see the *Undergraduate and Graduate Bulletin*).

ME 299–300: Thesis Research
OR 201: Survey of Operations Research Methods I
OR 202: Survey of Operations Research Methods II
OR 231: Theory of Traffic Flow
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
*U&RP 201: Introduction to Urban and Regional Planning
U&RP 208: Urban Transportation Planning
*U&RP 209: Urban Transportation Models

Required courses for MS degree: CE 220, 223, EngS 251, and OR 201.

WATER RESOURCES ENGINEERING

Option I: Water Resources Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 243: Environmental Impact Assessment
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 273: Water Supply Engineering
CE 274: Mechanics of Water Waves
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 279: Unit Operations in Environmental Engineering
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 312: Theory of Turbulence
OR 251: Linear Programming

* For course descriptions, see the *Undergraduate and Graduate Bulletin*.

OR 252: Nonlinear Programming
OR 273: Digital Systems Simulation

Required courses for degree programs: MS—ApSc 211 and/or 213 (depending on adviser's approval), CE 212, 213, ME 221; Professional and DSc—ApSc 213, 2[illegible] CE 282, 312, ME 231.

Option II: Water Resources Planning

ApSc 213: Analytical Methods in Engineering III
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 242: Solid Waste Disposal
CE 243: Environmental Impact Assessment
CE 273: Water Supply Engineering
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 279: Unit Operations in Environmental Engineering
CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 211–12: Engineering Administration
EAd 269: Elements of Decision-making and Problem-solving
EAd 283: Systems Engineering I
EAd 284: Systems Engineering II
EngS 206: Technology and Human Needs
EngS 213: Renewable Resources
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
OR 251: Linear Programming
OR 252: Nonlinear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 377: Advanced Stochastic Models in Operations Research
*Econ 217–18: Survey of Economics
*Econ 235: Energy Resources and Policy
*Econ 237: Seminar: Economics of the Environment and Natural Resources
*Geog 222: Seminar: Resources and the Environment
*Geog 223: Seminar: The Population-Food Balance
*PSc 206: Science, Technology, and Public Affairs

Required courses for MS degree: CE 212, 213, 276, 280.

Civil Engineering Graduate Courses

201 **Design of Metal Structures** (3)
Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

* For course descriptions, see the *Undergraduate and Graduate Bulletin*.

202 **Design of Reinforced Concrete Structures** (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

203 **Prestressed Concrete Structures** (3)

Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)

204 **Applied Soil Mechanics I** (3)

Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Spring)

205 **Applied Soil Mechanics II** (3)

Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Fall)

206 **Foundation Engineering** (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of Department. (Spring)

207 **Soil Dynamics** (3)

Stress-strain behavior of soil under transient and repeated loads, effects of earthquakes upon foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (As arranged)

208 **Rock Engineering** (3)

Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of Department. (As arranged)

209 **Theoretical Soil Mechanics** (3)

Advanced theories of consolidation. Yield condition in soils. Application of theories of plasticity in soil mechanics. Elements of wave propagation in soils, including surface waves. Prerequisite: ApSc 213, and CE 204 or 205. (As arranged)

210 **Methods of Structural Analysis** (3)

Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques; consideration of plastic collapse of structures; in-

troduction to the finite element method. Prerequisite: graduate st
(Fall)

211 Physical and Chemical Wastewater Treatment (3)

Theory and application of physical and chemical operation and proc
for wastewater treatment. Topics of discussion will include sedim
tion; flotation; disinfection; coagulation; flocculation; filtration; a
adsorption; reverse osmosis; ion exchange and thickening. Prerequi
CE 197 or equivalent; prerequisite or concurrent registration: (E
(Fall)

212 Open Channel Flow (3)

Types and regimes of flow; energy and momentum principles, uni
flow, gradually varied flow, spatially and rapidly varied flow. Flow
non-prismatic channels. Unsteady flow; dam break problem, flood r
ing. Prerequisite: CE 193 or ME 221. (Fall)

213 Hydraulic Structures (3)

Forces on structures and hydraulic design criteria. Design of conveyan
diversion, cross drainage, protective and water measurement structu
Prerequisite: CE 212 or approval of Department. (Spring)

214 Design of Dams (3)

Project planning and investigations. Types of dams; design of earth-r
fill dams and concrete gravity dams. Design of outlets, spillways, a
appurtenances. Construction methods for dams. Reservoir sedimentati
Safety inspection of dams. Prerequisite: CE 193 or graduate stan
(Spring, even years)

215 Urban Construction Technology (3)

Precedents and contemporary trends in urban housing, building, and pl
ning technology. Prerequisite: approval of Department. (Spring)

216 Advanced Hydrology (3)

Precipitation, evaporation, and transpiration. Soil physics; stream flo
drainage basins, hydrograph analysis, and stream-flow routing. Desi
criteria, flood frequency statistics and analysis, flood forecasting and co
trol, water supply forecasting. Prerequisite: CE 195 or equivalent.
(Spring)

219 Groundwater and Seepage (3)

Permeability theory of groundwater flow, flownets, analogs, computer s
lutions; applications to engineering problems such as excavation dewat
ing, flow through dams, stabilization of earth slopes. Prerequisite: Ap
211. (Fall)

220 Urban Transportation Engineering (3)

Introduction to urban transportation planning. Analysis of urban tran
portation requirements. Evaluation procedure for the selection betwee
alternative solutions. Prerequisite: approval of Department. (Fall an
spring)

221 Pavement and Runway Design (3)

Pavement types, wheel-load characteristics; stresses in pavements and su
grades; empirical methods of design of flexible and rigid highway and ai
field pavements; general principles of runway design. Prerequisite: C
202, and 204 or 205. (Spring)

222 **Stations and Terminals** (3)

Unified treatment of the functions and operation of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intra-modal and inter-modal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of Department. (Spring)

223 **Traffic Engineering** (3)

Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena; traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior; road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited access expressways; examples of traffic control system implementations. Prerequisite: approval of Department. (Fall)

237 **Advanced Sanitary Engineering Design** (3)

Basic principles and practical considerations; hydraulic and structural requirements; basic parameters and elements of design; layout and design of water supply and sewage systems, pumping stations, and wastewater treatment plants; development of design parameters; cost and financing; existing plant expansions. Prerequisite: graduate status. (Fall)

240 **Environmental Microbiology** (3)

Basic cellular organizations and processes related to waste treatment; microorganisms as disease-carrying agents in natural and waste water; laboratory tests for coliform organisms and viruses, and analysis of activated sludge. Prerequisite: approval of Department. (Spring)

241 **Environmental Chemistry** (3)

Chemical composition and chemical analysis of water; chemical treatment of water and waste water; laboratory tests of solids, BOD, COD, phosphorus, nitrogen, etc., as related to water quality. Prerequisite: approval of Department. (Fall)

242 **Solid Waste Disposal** (3)

Characteristics of solid waste; collection, transportation, and disposal practices; regional planning and management; resource and energy recovery from solid waste. Prerequisite: approval of Department. (Fall)

243 **Environmental Impact Assessment** (3)

Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies which have been developed to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution control facilities, and industrial and community development. Prerequisite: approval of Department. (Fall)

250 **Advanced Metal Structures** (3)

Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

251 Advanced Reinforced Concrete Structures (3)

Conception, analysis, and design of low-rise and high-rise buildings by ul- mate strength methods, precast systems, progressive collapse, earthqua considerations, domes, folded plates, shell-type structures and special topi Prerequisite: CE 202 or equivalent. (Spring)

252 General Structural Dynamics (3)

Analysis of single and multiple degree of freedom structural system un der steady-state and transient loads; response of discretized structura systems, such as rigid frames, plates, and thin shells under dynami loads, including earthquakes, wind, and blastic loading; introduction to probabilistic methods in structural dynamics. Prerequisite: ApSc 11 CE 210, or equivalent; and approval of Department. (Spring)

253 Failure and Reliability Analysis of Engineering Structures (3)

Operational and structural failure mechanisms; instability, fracture, cr fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and relia ty, optimal design criteria. Prerequisite: ApSc 115 or equivalent. (Fal

254 Special Topics in Structural Engineering (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 and approval of Department. Topic to be announced in the *Schedule of Classes.* (As arranged)

255 Coastal Processes (3)

Longshore currents and nearshore circulation; coastal sediment proper- ties and analysis, longshore transport processes and rates; sediment budgets response of beaches to wave action and structures; tidal inlets, mechanics bypassing; beach nourishment; wind transport of sandy dune stabilization; sediment tracing. Prerequisite: approval of Department. (Spring)

256 Introduction to Ocean and Coastal Engineering (3)

Application of wave motion in coastal and offshore regions: reflection, diffraction, refraction. Wave spectra: pro curement of spectral data by direct measurement or from hind-cast techniques. Beaches and littoral drift, mixing processes, outfalls and in takes in the oceans and estuaries, wave forces on coastal and offshore structures, harbor oscillations, tides in estuaries. Prerequisite: ApSc 11 ME 221; or equivalent. (Fall)

257 Harbor and Coastal Engineering I (3)

Waves and swells, tides and currents, coastal regime, estuaries and delta structures for coastal protection, principles of harbor navigation, harbor planning and harbor design, breakwaters and sea walls, quays, docks, internal access structures; maintenance of external and internal access dredging. Prerequisite: CE 256. (Spring)

258 Harbor and Coastal Engineering II (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling plat- forms. Design criteria, moorings and cables, harbor operations equip- ment. Prerequisite: CE 252 or equivalent; CE 257. (Fall)

261 Analysis of Plates and Shells (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 Design of Plate and Shell Structures (3)

Design of long-span plate and shell roof structures in reinforced concrete and metal; design of containers for fluids and granular materials; computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall)

263 Theory of Structural Stability (3)

General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures; effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 Special Topics in Geotechnical Engineering (3)

Selected topics such as rheology of soils, computer applications, excavation and tunneling, ocean engineering problems, or other special topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

266 Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I (3)

Nature of dynamic loads in problems which arise from earthquakes, tornadoes, hurricanes, and recurring winds; other natural hazard loading such as floods, expansive soils, storm surges, and tsunamis; characteristics of earthquakes; seismicity, zoning maps, response spectra, wind characterization, and wind tunnel simulation. Use of probabilistic concepts in load determination. Prerequisite: approval of Department. (Spring)

267 Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II (3)

Brief review of natural hazard loadings and random formulation; earthquake and wind design considerations and procedures; review of code requirements and specifications; balanced risk approach for natural hazards; cost effectiveness of integrated natural hazard design; special problems. Prerequisite: CE 266 or approval of Department. (Fall)

271 Theoretical Marine Hydromechanics (3)

Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of Department. Offered off-campus only. (As arranged)

272 Biological Wastewater Treatment (3)

Theory and application of biological methods for wastewater treatment. Principles of biological treatment; biological lagoons; trickling filter activated sludge process; anaerobic and aerobic digestion of sludge. Prerequisite or concurrent registration: CE 240. (Spring)

273 Water Supply Engineering (3)

Quantity and quality aspects of water supply engineering are discussed. Topics include reservoir sizing, groundwater, distribution systems, treatment processes and chemistry of waters. Prerequisite or concurrent registration: CE 240 and 241. (Fall)

274 Mechanics of Water Waves (3)

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: ME 221 or equivalent and permission of instructor. (Fall)

275 Special Topics in Ocean Engineering (3)

Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of Department. (Spring)

276 Water Resources Planning and Control (3)

The parameters of water resources planning and control; economics of water resources and related natural resources; economics of water quality control; physical parameters of water resource development; water resources law. Prerequisite: approval of Department. (Fall)

277 Industrial Waste Treatment (3)

The nature of industry and waste generation; industrial waste characteristics; waste measurements; techniques utilized in industrial waste treatment and control; nuclear waste control; reuse of industrial effluents and sewage for industrial process water; problems associated with treatment and disposal of industrial wastes and their effects on receiving waters. Prerequisite: CE 211 or equivalent; prerequisite or concurrent registration: CE 240. (Fall)

278 Pollution Transport System (3)

Distribution of pollutants in natural waters and atmosphere; diffusive and advective transport; mathematics for stream pollutant deoxygenation rates; groundwater pollution transport; sediment transport; thermal transport; numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall)

279 Unit Operations in Environmental Engineering (3)

Lecture and laboratory. Investigation of unit processes used in water and wastewater treatment. Current literature is reviewed and experiments carried out. Prerequisites or concurrent registration: CE 211, 272. (Spring, alternate years)

280 Water Resources Systems (3)

Water resources planning and control; water quality planning, water

supply planning, comprehensive planning and management. Case studies of systems. Prerequisite: CE 276. (Spring)

281 Special Topics in Water Resources (3)

Selected Topics: morphometric properties of drainage basins; drainage network analysis; hydraulic geometry of streams; advanced hydraulics of alluvial channels; modeling of drainage basins; computer applications; stochastic hydrology. Prerequisite: approval of Department. (As arranged)

282 Hydraulic Modeling (3)

Dimensional analysis and similitude. Types of models; physical models, mathematical models. Distortions in physical models. Erodible bed models. Prerequisite: CE 193 or ME 221 or graduate status. (Spring, odd years)

298 Research (arr.)

Basic research projects, as arranged. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

310 Sedimentation Engineering (3)

Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of Department. (Fall)

311 Mechanics of Alluvial Channels (3)

Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of Department. (Spring)

312 Advanced Hydraulics (3)

Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Summer)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Mechanical Engineering Graduate Courses

204 Advanced Instrumentation Techniques (3)

Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data

handling. Lecture and laboratory. Prerequisite: approval of Depart
(Fall)

215 Theory of Vibrations (3)

Damped and undamped natural vibrations, transient response and resp
to harmonic and periodic excitation, natural vibration of discrete
continuous systems; integral formulation of eigenvalue problems, resp
by modal analysis, approximate methods, influence of secondary ele
and constraints, damped systems. Prerequisite: approval of Departm
(Fall)

216 Structural Dynamics (3)

Methods of solving vibration problems: differential equation, Rayle
Ritz finite element. Free and forced vibration of structural compone
straight, curved, and thin-walled beams; plates and shells; sandwich c
struction. Vibration of built-up structures. Structural wave motion, s
motion in periodic structures. Prerequisite: ME 215. (As arranged)

218 Design of Floating and Submerged Marine Vehicles (3)

Consideration of interaction between hydrodynamics, propulsion, and c
figuration aspects of design of floating structures and vehicles; effects
submergence and deep submergence; hydrofoil and vertical jet actio
structural considerations. Prerequisite: EngS 228. (Fall)

221 Intermediate Fluid Mechanics (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-str
tensor; fundamental equations of the flow of viscous compressible fluid
Laplace's equations; source, sink, and doublet; vortices, Biot-Savart the
rem and the flow field of a vortex; spherical and cylindrical harmonic
methods of singularity distributions, complex-variable methods; lamin
flow of viscous incompressible fluids; boundary-layer concept. Prereq
site: approval of Department. (Fall)

222 Applied Fluid Dynamics (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifti
surface theory; singularity method for wing-body combination; vort
lift theory; effects of camber and twist distribution; transonic airfo
effect of wing sweep, area ruling concept; supersonic linearized wing th
ory; similarity rules. Prerequisite: ME 221 or equivalent. (Spring)

223 Aeroelasticity (3)

Introduction to aeroelastic phenomena; structural deformations of vehic
under static and dynamic loads; vibrations of vehicle structures; sta
aeroelastic problems (structural deformation, divergence, control effec
ness, and reversal); flutter theory and calculation of flutter bound
aerodynamics of steady and nonsteady two-dimensional wings in
sonic, sonic, and supersonic flow; strip theory applications of two-
sional aerodynamics to three-dimensional lifting surfaces; piston the
and Newtonian-flow theory. Prerequisite: ME 215, 221; or equiva
(Fall)

224 Fundamentals of Combustion Engines (3)

Classification of combustion engines: air cycles, vapor cycles, cycl
combustion engines, internal combustion engines; rotary engines, rec
cating engines, and turbomachinery; ideal cycle analysis; engine heat
and friction; practical cycle analysis status of computerized cycle ana
combustion and knocking; carburetion and fuel injection; mixture dist

tion; valve mechanism; ignition systems; combustion chamber; piston-engine, rotary-engine, and turbomachinery mechanics and balance. Prerequisite: approval of Department. (Fall)

225 Turbomachinery I (3)

Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy interchange in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, compressors, and pumps. Prerequisite: ME 221. (Fall)

226 Turbomachinery II (3)

Aerodynamics of aerofoils, flow in cascades, axial compressor aerodynamic design, axial turbine aerodynamic design, compressor and turbine matching. Combustion fundamentals, combustion chemistry, and gas turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 Viscous Flow (3)

Exact solutions of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; and ME 221 or equivalent. (Fall)

231 Hydrodynamics (3)

Flow at large Reynolds number: vorticity dynamics, Kelvin's theorem in inviscid flow, vorticity in motions generated from rest, boundary layers, applications of the momentum theorem. Irrotational flow theory: applications of Bernoulli and momentum theorems to steady flows, flow due to a rigid body, two-dimensional motion and applications of complex variable theory, free surface flows, Froude numbers, criterion of dynamic similarity. Effectively inviscid flow with vorticity: sheet vortex, flow with swirl, vortex system of a wing. Prerequisite: ME 221 or equivalent. (Spring)

235 Compressible Flow (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; and ME 221 or equivalent. (Spring)

237 Energetics of Fluid Flow I (3)

Energy transformations in fluid flows. Gas dynamics of combustion. Nonuniform flow, mixing. Mechanisms of flow induction. Applications to pumping, propulsion in water, air, and space, and thrust augmentation. Prerequisite: ME 155 or equivalent. (Spring)

238 Energetics of Fluid Flow II (3)

Wave processes and their utilization. Static, dynamic, and cryptosteady pressure exchange; energy equalizers and dividers. Advanced concepts of air and marine propulsion. Discussion of various concepts of flow induction, thrust generation, and environmental control. Prerequisite: ME 237 or equivalent. (Spring)

240 Kinematic Synthesis (3)

Techniques for the analysis and synthesis of function, path, and m generating mechanisms. Algebraic and graphical methods for the d sional design of mechanisms having prescribed performance cha istics. Design for higher-order requirements. Computer-aided tech for the optimal design of planar linkages using Burmester theory, plex number stretch-rotation operators, Chebyshev polynomials, etc view of recent developments and current research. Term project. (As arranged)

241 Engineering Systems Design (3)

Principles of systems design; interdisciplinary system simulation for chanical, electrical, fluid, and thermal sciences; dynamic response of tems; mathematical model and analogy studies; optimization techn with computer-aided solutions. Prerequisite: approval of Department (Spring)

242 Advanced Mechanisms (3)

Emphasis on spatial kinematics but with some attention to clas theorems of plane kinematics. Analysis and synthesis of mechanisms. A lytical techniques using matrices, dual numbers, quaternion algebra, and instantaneous screws, theory of envelopes. Applications to desig linkages, cams, gears, machined surfaces. Use of digital computer mechanism analysis and design. Prerequisite: ME 240. (Fall, a nate years)

243 Advanced Mechanical Engineering Design (3)

Design of mechanical engineering systems, components, and equipm requires the integration of engineering disciplines at an advanced le Prerequisite: approval of Department. (Fall)

246 Electromechanical Control Systems (3)

System synthesis, compensation, and stabilization using Bode diagra root locus, etc.; linear and nonlinear characterization of mechan electromechanical, and electronic control components. Prerequisite: proval of Department. (Fall)

247 Fluidics (3)

Introduction of fluidic components and systems: behavior and mat of bistable and proportional jet devices, vortex amplifiers and sensi passive elements, transmission lines; system synthesis, coupling effe Survey of current applications and research. Prerequisite: approval Department. (Spring)

***248 Seminar: Aircraft Design I (3)**

Designing an aircraft to specifications. Regulatory requirements, va the-art limitations, computer-aided design, integration of aircraft ponents, economic considerations, and iterations to final configuration obtain specified mission profile. Prerequisite: approval of Departme (As arranged)

***249 Seminar: Aircraft Design II (3)**

Aircraft design in relation to prescribed mission requirements, data configurative concepts, detail design features. Estimation of weight, s and power of an aircraft to satisfy mission specifications; design trad offs and compromises. Emphasis on subsonic aircraft for steady cruis

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of Department. (Spring)

251 **Advanced Electromechanical Control Systems** (3)

Time domain analysis and design of electromechanical control systems using state space methods and matrix differential equation techniques. Advanced stability analysis and design optimization techniques for both linear and nonlinear systems. Examples taken from practical mechanical components and systems including continuous and discrete time systems. Introduction to electromechanical switching system theory and practice. Prerequisite: ME 246. (As arranged)

254 **Intermediate Heat and Mass Transfer** (3)

Fundamentals of heat and mass transfer, its laws and properties. Conduction equations and solutions for steady and transient cases. Convection of heat and mass. Dimensionless numbers and boundary layer concepts. Laminar, transition, and turbulent flows. Radiation in transparent media and at surfaces. Application to combustors and solar devices. Prerequisite: ApSc 213. (Fall)

255 **Urban Transportation Technology** (3)

An introduction to the technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life cycle costs, and measures of system effectiveness. Prerequisite: approval of Department. (Fall)

257 **Energy Technology I**

An overall view of energy technology, supply and demand, and the relation among energy, environment, and institutional problems. Regression analysis, forecasting of supply and demand, energy systems modeling, analysis of cycles, Second Law analysis, nuclear energy, and energy transmission. Prerequisite: approval of Department. (Fall)

258 **Energy Technology II**

Continuation of ME 257. Various forms of solar energy (e.g., heating and cooling, photovoltaics, wind, biomass, ocean thermal gradients), tidal energy, geothermal energy, energy and food production, energy systems design, and energy policy. Prerequisite: ME 257. (Spring)

259 **Solar Heating and Cooling of Buildings** (3)

Availability of solar energy, climatic data for solar heating and cooling. Passive, active and hybrid systems. Methods of solar energy collection and storage. Subsystems performance evaluations; systems analysis by computer methods; long-term performance predictions. System configurations, control requirements. Solar heating and cooling system economics; architectural features and considerations, standards. Prerequisite: approval of Department. (Fall)

260 **Heating and Air Conditioning of Buildings** (3)

Basic concepts and engineering data including psychometrics and comfort conditions. Heating and cooling load calculations, computer programs for system design and for energy consumption analysis. Codes and standards for building energy management, energy conservation opportunities. Heating and air conditioning systems; all air, air and water, all water systems, central control systems. Cost estimates and economic analyses, life-cycle costing. Prerequisite: ME 187 or equivalent. (Spring)

261 Air Pollution I (3)

An introductory course on the generation, monitoring, and control o pollution. Elements of the system: generation of particulate and ga pollutants in natural, industrial, and energy-generating system transformation as they diffuse into the dynamic sun-irradiated atmosp assessment of their impact through monitoring and inventory of e sions sources. Effects on health and welfare on urban, regional global scales. Air pollution standard setting and control strategy d opment. Prerequisite: approval of Department. (Fall)

262 Air Pollution II (3)

Laboratory and field survey and assessment of air pollution proble A variety of laboratory techniques will be used to measure actual and air quality, and laboratory and field sampling of pollutant levels inside immediately outside combustion systems will be conducted. Diffusion chemical models will be used to relate sources and sensors of air p tion. A field air pollution impact assessment project will culminate course activity. Prerequisite: ME 261 or equivalent. (Spring)

263 Air Pollution Control Technology (3)

Theoretical and applied aspects of aerosol and gaseous emission co from both stationary and mobile sources. Aerosol controls: sedim tion, precipitation, filtration, and wet collection. Application of scrubb catalysts, and combustion modification to control of gaseous emissi from stationary sources. Special techniques for fine particulate con (fabric, electrostatics). Control of automotive emissions through en modification, catalysts, and alternative power systems. Vapors, odors, noise. Prerequisite: ME 261 or equivalent. (Spring)

264 Air Pollution Seminar (3)

Special interest and advanced topics not covered in ME 261, 262, or 2 Special lectures by individual experts. Participants will be required conduct a special topic study for contribution to the seminar. Prerequ site: approval of Department. (Fall)

265 Air Pollution Meteorology (3)

Weather and motion systems of atmosphere: ground- and upper-level p conditions: atmospheric stability and inversions: atmospheric turbulence and diffusion: urban and topographic effects upon meteorological parame ters: effects of meteorological parameters upon transportation and dis of pollutants: meteorological factors in plant location, design, and ope tion, and in urban planning. Prerequisite: ME 221 or equivalent. (Fall)

***270 Aerodynamics of Flight Vehicles** (3)

Aerodynamic loads on flight vehicles, interference effects, application o aerodynamic theory to aircraft design, studies of aircraft dynamics and per formance. Prerequisite: ME 222 or equivalent. (Spring)

***271 VTOL Aircraft Technology** (3)

Fundamental principles of VTOL aircraft; hovering performance based momentum theory; analysis of jet-induced interference effects; transitio aerodynamics; theoretical stability and control and correlation with flig data; ground-effect theory and experiment; handling qualities criter

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

elements of instrument approach and landing problem. Prerequisite: approval of Department. (Spring)

***272 Powered-Lift Technology** (3)

Basic principles of powered-lift aircraft; high-lift aerodynamics; low-speed stability and control; fundamentals of internally blown and externally blown powered-lift concepts; the spanwise blowing scheme to delay wing stall; use of powered-lift for improved maneuverability of fighter aircraft; aerodynamic ground effects; alleviation of noise of powered-lift systems; aerodynamic loads associated with blown flaps. Prerequisite: approval of Department. (Fall)

***273 Principles of Automatic Flight Control** (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of Department. (Fall)

***274 Principles of Flight Guidance** (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 Stability and Control of Vehicles (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency response analysis. Prerequisite: approval of Department. (As arranged)

***276 Mechanics of Space Flight** (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of Department. (As arranged)

277 Numerical Methods in Fluid Mechanics (3)

Numerical solution of partial differential equations of fluid flow; finite-difference techniques for viscous and inviscid flows; stability; methods of characteristics; boundary conditions; applications in subsonic and supersonic flows. Prerequisite: ApSc 213, EngS 284; or equivalent. (As arranged)

***278 Performance, Stability, and Control of Helicopters** (3)

Development of rotor blade theories; actuator disc, blade element, vortex theory. Hovering and climb performance, autorotation and forward flight performance. Rotor system mechanics, flapping motion of articulated and semi-rigid rotors, blade motions in plane of rotation. General performance and design considerations. Stability and control in hovering and forward flight, damping in pitch and roll, static stability with speed and angle of attack. Prerequisite: ME 222, 275. (Spring)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

***279 Special Topics in Flight Sciences (3)**

Current problems and methods in high angle of attack stability and trol. Nonlinear aerodynamics in the angle of attack region abov stall. Influence of aircraft design and nonlinear aerodynamics parame on the poststall stability and control of aircraft. Employment of s experimental techniques and development of equations pertaining t veloped spin and recovery characteristics. Prerequisite: ME 275 o proval of Department. (Spring)

280 Intermediate Thermodynamics (3)

Thermodynamic systems; Gibbs equations; potentials, thermodynami lationships, equilibrium and stability. Statistical thermodynamics; f ability and macrostates; properties of perfect gases, mixtures, and cry Elements of kinetic theory and its application to transport proper Introduction to relativistic thermodynamics. Application to chemical actions, thermal radiation, magnetic, electric, and solid systems. Prer site: approval of Department. (Fall)

281 Nonequilibrium Thermodynamics (3)

Molecular theories of gases; thermodynamic properties and Boltzmann integro-differential equation, the H-theorem and entropy; equations state and potentials; the equation of change and velocity distribution f side equilibrium; transport properties. Field theory. Constitutive l ance, and Gibbs equations. Variational principles. Application to tra port processes in engineering systems. Prerequisite: ME 280. (Spri

282 Fossil Fuels (3)

Coal, petroleum, and natural gas. Fossil fuel reserves, methodologies estimating and exploring for fossil fuels. Geophysical, geochemical a satellite techniques. Prerequisite: Chem 152. (As arranged)

283 Nuclear Reactor Engineering I (3)

World energy resources and the importance of fission energy; atomic an nuclear structure; nuclear fission and chain reaction; critical mass; nuclear reactor classification; history of reactor development; nuclear reaction and radiations; radioactive decay; radiation detection, hazards, and pro tection; neutron reactions; neutron diffusion and slowing down; the criti cality condition; reflected reactors; homogeneous and heterogeneous reac tor systems; transient reactor behavior and control; description of pres surized and boiling water reactors; other reactor systems. Environmental considerations; reactor safety. Prerequisite: approval of Department. (Fall)

284 Nuclear Reactor Engineering II (3)

Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor materials problems; reactor fuels; shielding; mechani cal and structural components; preliminary reactor design; fuel cycles; description of nuclear reactor systems; engineered safety systems; economics of nuclear power. Prerequisite: ME 283. (Spring)

***285 Reaction Kinetics (3)**

Theoretical aspects of kinetics of homogeneous and heterogeneous reactions in gaseous and liquid systems. Prerequisite: ME 280. (Spring)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

286 Special Topics in Mechanical Engineering (3)

Prerequisite: approval of Department. (As arranged)

287 Heat Conduction (3)

Conduction of heat through solid, liquid, and gaseous media; formulation and methods of analytical, numerical, and analog solutions; steady two- and three-dimensional problems, problems in unsteady heat conduction; conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall)

288 Convective Heat and Mass Transfer (3)

Heat and momentum transfer in laminar and turbulent flow; application of boundary-layer theory to problems of forced convection; the laminar boundary-layer and similarity solutions; heat convection in turbulent flow, momentum-heat transfer analogy; the influence of temperature-dependent fluid properties; convective heat transfer at high velocities; mass transfer; formulation of a simplified theory; some solutions to the conserved property equation. Prerequisite: ME 221 or equivalent. (Spring)

289 Radiative Heat Transfer (3)

Nature of thermal radiation; radiative characteristics of surfaces; thermal radiation within evacuated enclosures; configuration factors algebra; solution methods for the integral equations of radiant interchange; enclosures containing an absorbing and emitting medium; absorbing, emitting, and scattering media; combined radiation, conduction, and convection. Prerequisite: ApSc 214 or equivalent. (Fall)

***290 Kinetic Theory of Gases (3)**

Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (Spring)

291–92 Power Systems (3–3)

Design of thermal power system components and system optimization. Steam cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 Combustion (3)

Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of Department. (Spring)

294 Wind Energy (3)

Technical and economic problems of energy extractions from wind. Examination of the morphology of conversion devices; energy extraction

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

from a moving fluid stream; aerodynamics of rotors. Nature of th its special, temporal, and terrain-dependent variables. Structural, dy and electrical problems and requirements; systems tradeoffs in wi bine design. A wind turbine will be designed. Prerequisite: appro Department. (Fall)

295 Statistical Thermodynamics (3)

Distribution functions; Boltzmann, Bose-Einstein, and Fermi-Dira tistics; partition functions, correspondence between classical and stat thermodynamics. Systems with negligible effects of interparticle f perfect gases, perfect electron gas, photon gas. The Debye solid Einstein solid. Prerequisite: ME 280. (Spring)

296 Special Topics in Heat and Mass Transfer (3)

Prerequisite: approval of Department. (As arranged)

297 Special Topics in Fluid Mechanics (3)

Prerequisite: approval of Department. (As arranged)

298 Research (arr.)

Research as arranged. May be repeated for credit. (Fall and spr

299–300 Thesis Research (3–3)

(Fall and spring)

310 Mechanics of Non-Newtonian Fluids (3)

Classification of fluids; physical properties of composite fluids; convec coordinate systems; fundamentals of constitutive equations of compo fluids; purely viscous fluids, Reiner and Rivlin theories, power-law flu linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear vis elasticity; nonlinear theory of viscoelasticity, Rivlin-Ericksen theory coplastic fluids, Bingham plastic fluids, Oldroyd's analysis; viscometry rheogoneometry; turbulent flow of suspensions and emulsions in pipe frictional drag reduction by polymeric additives. Prerequisite: approv of Department. (Fall)

311 Nonsteady Flow (3)

Eulerian and Lagrangian kinematics. Fundamental equations of mo steady viscous flow. Characteristics and waves; initial and boundar conditions. Piston theory and the oscillating airfoil. Nonsteady flow with entropy production. Discontinuities, interactions, and special tra sients. Gasdynamics of nonsteady combustion. Analogies and applica tions. Prerequisite: ME 235 or ME 237 or equivalent. (Fall)

312 Theory of Turbulence (3)

Concept of turbulence, transition and linear theory of flow stability perimental observations on turbulence generation, turbulent kinetic e ergy distribution, statistical description of turbulence, energy cascade a energy spectrum in turbulence, mean turbulent energy and Reynol stress closure models, turbulent shear flows in free turbulence and wa turbulence, turbulence in atmospherical environment and effects on pollution and weather systems, turbulent drag reduction. Prerequis ME 227. (Fall)

313 Magnetofluidmechanics (3)

Thermodynamics and fluid mechanics of electrically conducting liquid and gases; theory and applications; thermodynamics and transport pro

erties of plasmas formulated; reaction kinetics and plasma reactions; fundamental equations (mass, momentum, and energy) of magnetofluidmechanics; flow with infinite and finite conductivity, Alfven waves and wave phenomena, flow with heat transfer and friction, relativistic magnetofluidmechanics, dimensional analysis and scaling parameters, applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221, 280. (As arranged)

315 Hypersonic Flow (3)

Small-disturbance theory, Newtonian theory; constant-density solution, theory of thin shock layers, flow over blunt bodies, hypersonic viscous flow. Prerequisite: ME 227. (Fall)

317 Physical Gas Dynamics (3)

Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235; and ME 295 or equivalent. (Spring)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

ngineering Science Graduate Courses

201 History of Technology I (3)

The characteristic technologies of Prehistory, the Ancient Near East, Greece and Rome, Byzantium and Islam, and Christian Europe. Technology is broadly defined. Emphasis is on its manifold interactions with other cultural forces. (Fall)

***202 Advanced General Metrology (3)**

Topics in the conceptual, physical, and mathematical aspects of measurement, standards, design for precision measurement, and measurement at extreme values. Prerequisite: graduate status. (Fall—evening)

***203–4 Probability and Statistics of Metrology (3–3)**

Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent. (Academic year—evening)

206 Technology and Human Needs (3)

Sociology of science and technology, the solar systems and earth, population, nonrenewable resources, renewable resources, energy, nuclear energy, renewable energy conversion, environment, productivity, transportation. Prerequisite: approval of Department. (Fall and spring)

Offered at NASA-Langley Research Center; may be offered on campus when arranged.

207 Engineering Climatology (3)

Constitution of physical properties of earth and atmosphere, stabili
ditions, energy balance characteristics, atmospheric motions, storm
casting models, tree-ring analysis, evaporation, precipitation, fog f
tion, soil moisture, ground frost. Prerequisite: approval of Depar
(As arranged)

208 Energy Conservation (3)

Methods of conserving energy without sacrificing productivity an
quality of life. Conservation methods in the home, in transportatio
industrial, manufacturing, and commercial sectors. Second law of
modynamics from a conservation viewpoint. Construction method
low-energy consumption in large and small edifices. Environmental c
and low-fuel consumption in ground and air transportation. Greenh
and natural fertilizers. Prerequisite: approval of Department.
ranged)

210 Quantitative Aspects of Social Phenomena (3)

Mathematical models presenting social phenomena. Historical revie
attempts to quantify social phenomena. Population growth, birth
death rates; population diffusion; Lancaster equation; Richardson's
proach; the Forrester-Meadows model. Kinetic theory formulation
peaceful co-existence. Probability distributions, characteristic functio
and central limit theorem. Brownian motion approach to speculation
the stock market. Traffic flow, the statistical approach and Lighth
method. Quality-of-life indicators and quantification of social indic
Environmental modeling. Thermodynamics approach to self-rejuvenat
systems and its application in government and organizations. Prerequ
approval of Department. (As arranged)

212 Nonrenewable Resources (3)

Interplay of geology, engineering, and economics on resources. Role
resources in society, concepts and definitions for analyzing resource issue
Mineral commodities, their world distribution, geology, production tec
nologies and costs, transportation systems, consumption patterns, subs
tutes, recycling. Environmental impacts, energy requirements, recy
and problems in mineral conservation; the threat of mineral cartel
Analysis of optimistic and pessimistic forecasts of future resource de
pletion. Prerequisite: approval of Department. (As arranged)

213 Renewable Resources (3)

Food and fiber, solar energy and radiation, photosynthesis. Agricultura
and forest biomass production, seasonal availability, collection and t
planting. Substitution of renewable resources for depletable. Food-ener
relationship. Biological and chemical conversion processes, direct c
bustion, pyrolysis, enzymatic hydrolysis, and hydrogenation. Economi
of scale and life cycle cost of conversion systems. Environmental a
socio-economic impacts of alternative land usage. Institutional barrier
Prerequisite: approval of Department. (As arranged)

214 Geothermal Energy (3)

Geothermal energy due to thermal gradients in the earth, fundamentals o
geological gradients, geographic location of potential geothermal energ
sources, comparison of methods of exploration and study of steam
hot rock systems. Generation of electricity from geothermal sources
Obtaining hot water process heat. Equipment design. Environmental e

fects and means of mitigating adverse conditions. Prerequisite: approval of Department. (As arranged)

215 **Advanced Strength of Materials** (3)

Advanced problems of stress and strength analysis of structural and machine elements: bending, torsion and buckling of thin-walled structures. Curved beams, stress-concentrations, thermal stresses, creep instability and stress relaxation, contact problems, composite elements. Prerequisite: approval of Department. (Spring)

217 **Analytical Mechanics** (3)

Fundamental principles, generalized coordinates, variational principles and Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of Department. (Fall)

218 **Introduction to Continuum Mechanics** (3)

Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of Department. (Fall)

221 **Theory of Elasticity I** (3)

Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of Department. (Spring)

222 **Theory of Elasticity II** (3)

Application of integral transforms and analytic function theory to solution of plane problems in static and dynamic elasticity. Introduction to three-dimensional elastostatics. Prerequisite: EngS 221, ApSc 211. (Fall, odd years)

228 **Physical Oceanography** (3)

Seawater, equations of motion, interaction between air and sea, currents, wind-waves in deep and shallow waters, long ocean waves, tides, wave-statistics, sea ice. Prerequisite: ME 221 or equivalent. (Spring)

229 **Transformations in Materials** (3)

Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of Department. (Spring, odd years)

230 **Deformation of Materials** (3)

Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening, mechanisms of creep, yield, and fracture. Prerequisite: approval of Department. (Fall, odd years)

231 **Structure of Materials** (3)

Space lattices, crystal structures, planes, directions, anisotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue techniques, moving crystal diffraction, Debye-Scherrer method, X-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of Department. (Fall, even years)

233 Mechanics of Composite Materials (3)

Stress-strain relationship for orthotropic materials; invariant properties of an orthotropic lamina; biaxial strength theory for an orthotropic lamina; mechanics of materials approach to stiffness; elasticity approach to stiffness; classical lamination theory; strength of laminates; statistical theory of fatigue damage for composites. Prerequisite: approval of Department. (Spring, even years)

234 Composite Materials (3)

Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of Department. (Spring, odd years)

236 Experimental Techniques in Materials Science (3)

Sample preparation. Optical microscopy including polarized light methods, phase contrast, interferometry. X-ray microscopy including Laue technique and Debye-Scherrer method. Electron probe microanalysis. Electron microscopy including electron optics, image formation and contrast for scanning and transmission electron microscopy. Field ion microscopy. Prerequisite: approval of Department. (Spring, even years)

237 Environmental Effects on Materials (3)

Aqueous corrosion, electrochemistry, electrochemical reactions, polarization, environmental factors, integranular corrosion, stress corrosion, high temperature corrosion, kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of Department. (Fall, even years)

***239 Physical Ceramics** (3)

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering, vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria in ceramic systems. Prerequisite: approval of Department. (Spring)

240 Fracture Mechanics (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approximations, crack propagation laws, fatigue, fracture testing, comparison of results, continuum theories. Prerequisite: EngS 221 or CE 261. (Spring, even years)

241 Failure of Materials (3)

Tensile and shear deformation, yield, dislocation motion, geometry of slip, single and polycrystal deformation, twinning, creep deformation, polymer deformation, fracture, Griffith Theory, fracture toughness, transition temperature, microstructure effects, environmental effects, stress corrosion cracking, cyclic stress and strain, fatigue crack initiation and propagation, statistical analysis, low cycle fatigue, failure analysis. (Fall)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

242 **Materials Recycling and Recovery** (3)

Techniques and technologies for recovering and re-using waste materials and developing low-resource waste systems. Direct relationships of recycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and products; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of Department. (Spring)

*249 **Special Topics in Materials Science** (3)

Prerequisite: approval of Department. (As arranged)

251–52 **Transportation Workshop** (3–3)

Students and staff from various disciplines are brought together for study of a selected transportation topic, or for study of the land-use objectives and transportation needs of a selected urban area and a survey of pertinent information and applicable solutions. Prerequisite: approval of Department. (Academic year)

253 **Operational Control of Urban Transit Networks** (3)

General discussion of the essential functions of operation and control for various systems, with emphasis on the automation of these functions. Regulation of roadway traffic flow, management of public transit fleets, and automatic control of subways and of automated guideway transit systems. Prerequisite: approval of Department. (Spring)

256 **Introduction to the Theories of Inelastic Media** (3)

Physical basis of anelasticity, viscoelasticity, plasticity, and viscoplasticity; constitutive equations of elastic and viscoelastic media; foundations of the theories of plasticity and viscoplasticity; boundary-value problems and wave propagation in inelastic media. Prerequisite: ApSc 213 or equivalent and approval of Department. (Spring, odd years)

259 **Random Vibration of Structures** (3)

Introduction to random processes; responses of linear structures to stationary and nonstationary random inputs; structural responses to earthquakes, storm waves, boundary layer turbulences, wind loads, random temperature, etc.; failure analysis of structures under random loads; first passage failure, fatigue, stress-corrosion and crack propagation under random stress histories. Prerequisite: CE 252 or ME 215 or approval of Department. (Fall)

260 **Random Process Theory in Engineering** (3)

Spectral analysis, linear system, the superposition principle; statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values; statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent. (Fall)

*263 **Atmospheric Physics for Engineers I** (3)

Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of Department. (As arranged)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

***264 Atmospheric Physics for Engineers II** (3)

Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of Department. (As arranged)

270 Theoretical Acoustics I (3)

Basic acoustic theory in stationary and uniformly moving media; wave in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 215, ApSc 213, or equivalent. (As arranged)

***271 Random Process Theory I** (3)

Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of Department. (As arranged)

***272 Random Process Theory II** (3)

Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271. (As arranged)

***273 Time Series Analysis** (3)

Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; periodogram, Blackman-Tukey and direct filtering methods of spectral estimation; effects of finite length and digitization; variability; coherence. Fast Fourier transform techniques; applications in modern technology. Prerequisite: EngS 271 or approval of Department. (As arranged)

274 Environmental Noise Control (3)

Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

***275 Theoretical Acoustics II** (3)

General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometrical acoustics. Prerequisite: EngS 270. (As arranged)

***276 Acoustical and Mechanical Measurements** (3)

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

*277 **Physical Acoustics** (3)

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

*278 **Psychological and Physiological Acoustics** (3)

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of Department. (As arranged)

*279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress. (Spring)

*280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of Department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Mechanics Problems** (3)

Techniques for efficient construction of large computer programs for engineering systems with emphasis on fundamental structured programming principles. Application to engineering mechanics systems such as finite elements and structural optimization. Effects of CPU organization and other hardware features of computer systems at NASA-Langley on numerical computations involved in engineering systems. Organization and management of data bases for large engineering mechanics systems. Prerequisite: approval of Department. (Spring)

282 **Computer-aided Design** (3)

Fundamental concepts in the development of computational algorithms for the design of structures, machine component and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote access computer terminals. General purpose computer programs for engineering analysis and design. Students, individually or in groups, are required to develop a small-scale general-purpose design program in an appropriate area such as structural design, machine design, urban planning, environmental quality control, etc. Prerequisite: EE 51 or equivalent, and CE 210 or equivalent, and approval of Department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)

Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points.

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

Representation of two- and three-dimensional geometrical shapes by a of discrete points. Automatic generation and display on CRT screen geometrical shapes consisting of a grid of discrete points interconnec by user-selected geometric shapes. Automatic mesh generation, trans mations, projections, and the concept of "hidden" lines. Use of re computer terminals and graphic plotter equipment in interactive comp graphics applications. Prerequisite: EE 51 or equivalent, and Engr or equivalent. (Spring)

284 Numerical Methods in Engineering (3)

Uses of computers in engineering and science; numerical interpola integration and differentiation; least squares approximations and ap cation to data fitting; roots of polynomials; eigenvalue and eigenvec problems; solution of systems of linear equations; ordinary differen equations; introduction to solution of partial differential equations. A plications to initial and two-point boundary value problems in e neering mechanics and other areas of engineering. Prerequisite: approv of Department. (Fall)

285 Finite Element Methods in Engineering Mechanics (3)

Formulation of the finite element method through variational principl for structural and continuum mechanics problems. Plane stress, pla strain, three-dimensional elasticity, plate bending, thermal conduction, a potential flow. Techniques of constructing and assembling characteris elemental matrices, computer implementation of the finite element meth Prerequisite: approval of Department. (Spring)

***286 Analysis and Design of Thin-walled Structures (3)**

Statics of thin-walled beams and panels, force interplay between stiffe ers and skin in the analysis and design of stiffened thin-walled structure strength and stiffness of locally buckled stiffened structures; classificat of loads and safety factors; different considerations governing the desig of thin-walled structures; critical evaluation of various structural desig procedures. Prerequisite: approval of Department. (As arranged)

***287 Automated Design of Complex Structures** (3)

Review of techniques for automated design including mathematical pro gramming, fully stressed design, and optimality criteria; application o automated design techniques to stiffened and composite shell-type struc tures; multiple-load conditions and design constraints. Prerequisite: ap proval of Department. (As arranged)

288 Advanced Finite Element Methods in Structural Mechanics (3)

Formulation of various finite element models in solid mechanics. Examin nation of errors, convergence characteristics. Application to nonlinear sta dynamic problems including large deflection, stability, and inelastic mate lems. Recent developments of finite element methods. Prerequisite: Engr 285. (As arranged)

289 Special Topics in Theoretical and Applied Mechanics (3)

Prerequisite: approval of Department. (As arranged)

298 Research (arr.)

Basic research projects as arranged. May be repeated for credit. (Fall and spring)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

299–300 **Thesis Research** (3–3)
(Fall and spring)

*310 **Aeroacoustics** (3)
General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)
Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of Department. (As arranged)

*312 **Theory of Random Vibration** (3)
Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)

*313 **Structural Acoustic Interaction** (3)
Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

314 **Advanced Numerical Methods in Engineering** (3)
Advanced methods for numerical solution to engineering problems: finite difference solutions to elliptic, parabolic, and hyperbolic equations, method of characteristics, implicit and explicit initial value methods and their stability, optimization and mathematical programming methods, numerical solutions to integral equations, selected topics for fourth-generation computers. Prerequisite: EngS 284, ApSc 213. (Spring)

315 **Introduction to Nonlinear Mechanics of Continua** (3)
Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions; deformation, kinematics, stress, balance principles; principles for constitutive relations; applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring)

398 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)
Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

Electrical Engineering and Computer Science

Electrical Engineering and Computer Science

Professors A. Abdalla, M.F. Eisenberg, A.D. Friedman *(Chairman)*, H.J. gert, R.B. Heller, W.K. Kahn, R.H. Lang, W.D. Maurer, A.C. Meltzer, Merwin *(Research)*, R.L. Pickholtz

Professorial Lecturers J.M. Aein, W.T. Bisignani, J.T. Coleman, P.J. Cre W.F. Croswell, G. Frenkel, D. Hogan, S. Karp, E.M. Lipsey, M.J. M T.P. McGarty, S.A. Musa, L. Scharff, K.R. Shah, J.E. Shore, R. Thi W. Wasylkiwskyj, A.A. Wolf, H-L.A. Hung

Associate Professors S. Berkovich, E.H. Braun, R.L. Carroll, Jr., M.B. Fo man, J.D. Foley, L.J. Hoffman, N. Kyriakopoulos, T.N. Lee, M.H Le R.J. Harrington

Associate Professorial Lecturers J.G. Adler, C. Alexander, Jr., J.W. Bea P.D. Bergstrom, J.H. Carson, H. Carus, S. Das, C.E. Dunham, A.S. G W.R. Hahn, W. Klaus, J.A. Knight, L.M. Leibowitz, D.M. LeVine, G Lyon, C.F.H. Manders, F.P. Pantuso, D.H. Pugh II, F.J. Ricci, D.C. Ro D.C. Roberts, L.A. Rubin, A. Schneider, J.N. Shoosmith, J.R. Silverm C.C. Wang, W.W. Wu, A. Zachai, R.M. Zeskind, A.J. Ziffer

Assistant Professors M.E. Zaghloul, S.C. Chang

Assistant Professorial Lecturers R.D. Angelari, T.M. Bottegal, F.M. Brod Y. Chang, C-K. Cho, T. Collins, R. Cunningham, N. Dressner, D. Engl R. Evans, P.J. Fox, M. Fritts, Y. Fu, M.S. Gluck, T. Husson, S.H. Ka G. Kowalski, P.A. Lamb, D.D. Loendorf, E.H. Neal, L.F. Pau, A. Manfredi, Jr., D.L. Reaugh, R. Shanker, D.R. Smith, J.H. Tucker

Special Lecturer P. Bock

UNDERGRADUATE STUDY

Electrical engineering as an engineering discipline is concerned with mastering a knowledge of electricity. Electrical engineers design generators, which pro vide electrical energy for homes and factories, and transmission networks and the motors which utilize this power to drive machinery. By developing electro magnetic radiation, electrical engineers produce radio waves for the propagation of radio and television signals and the transmission of information via satel Electrical engineers design and develop electronic circuits used in communica tions equipment and computers. These machines have enhanced our thinking and computational capabilities to permit mankind to solve some of its most complicated problems. Microminiaturization of electronic components has per mitted the development of handheld calculators and portable communication equipment. Electrical engineers are developing new instrumentation to assist the medical profession in understanding the causes of disease and to aid in pre serving and prolonging life. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engi neers. The world's primary energy sources are limited, and electrical power will become an even more important resource. Electrical engineers are involved in the research to produce electrical energy directly from solar power.

Electrical engineering is a branch of engineering in which practical as well as theoretical and scientific aspects are integrated into a well-balanced discipline. Basic sciences such as physics and mathematics form the roots on which electrical engineering builds to create an applied science and to develop problem-solving techniques. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated approach. The first two years of the curriculum are common to all undergraduate fields in the School and allow students to develop a sound foundation of basic sciences coupled with engineering sciences. The third year continues with engineering sciences and begins an in-depth study of electrical engineering. The fourth year is devoted totally to electrical engineering. At the beginning of the fourth year the student has a choice of either following the regular electrical engineering curriculum or branching off into an area of concentration in computer science or in premedical engineering.

The Department of Electrical Engineering and Computer Science has modern laboratory equipment, including its own computer. The student has an opportunity during the last year to work on individual projects where ingenuity, coupled with faculty advice and guidance, allows concentration in areas such as computers, communications, microwaves, controls, electronics, medical engineering, and circuits.

Course schedules have been arranged to accommodate the full-time, the part-time, and the co-op student. Undergraduate courses are offered once a year during the day for full-time students, and once every two years in the evening for part-time students.

Subject Areas

COMMUNICATIONS

EE 143: **Elements of Communication Engineering Design I**
EE 144: Elements of Communication Engineering Design II
EE 146: **Communications Laboratory**

COMPUTER SCIENCE

CSci 51: **Applications of Computers**
CSci 52: **Computers and Societal Problems**
CSci 100: **Introduction to Computer Science**
CSci 150: **Introduction to Microcomputers**
CSci 151: **Introduction to Systems Programming I**
CSci 153: **Design of Switching Systems**
CSci 154: **Digital Computer Design**
CSci 155: **Introduction to Numerical Methods for Computers**
CSci 156: **Introduction to Systems Programming II**
CSci 157: **Machine and Assembly Language Programming**
CSci 158: **Algorithmic Methods and High-level Languages**
CSci 159: **Programming and Data Structures**
CSci 166-67: **Computer Science Laboratory I and II**

CONTROLS, SYSTEMS, AND POWER

EE 166: **Power Systems Laboratory**
EE 172: **Control Systems Design**
EE 176: **Control Systems Laboratory**
EE 177: **Electrical Energy Conversion**
EE 178: **Electrical Power Systems**

ELECTRONICS

EE 20:	Introductory Engineering Electronics
EE 121:	Engineering Electronics and Design
EE 122:	Pulse and Waveshaping Electronic Design
EE 124:	Electronic Devices
EE 169:	Advanced Electronics Design Laboratory

FIELDS AND WAVES

EE 31:	Fields and Waves I
EE 32:	Fields and Waves II
EE 133:	Electromagnetic Waves and Microwave Systems Design
*EE 168:	Microwave and Laser Engineering Laboratory

LABORATORIES AND MEASUREMENT

CSci 163:	Senior Electrical Engineering Project Laboratory I
CSci 164:	Senior Electrical Engineering Project Laboratory II
EE 63:	Instrumentation and Networks Laboratory
EE 65:	Introductory Electronics Laboratory
EE 66:	Digital Electronics Design Laboratory
EE 67:	Switching Circuits Laboratory
EE 163:	Senior Electrical Engineering Project Laboratory I
EE 164:	Senior Electrical Engineering Project Laboratory II

MEDICAL ENGINEERING

EE 184:	Medical Engineering Instrumentation and Systems Design
*EE 186:	Medical Engineering Laboratory

NETWORKS

EE 11:	Linear Networks I
EE 12:	Linear Networks II
EE 113:	Network Analysis and Design
EE 116:	Introduction to Network Synthesis

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

BiSc 11:	Introductory Biology for Science Majors (4) (Pre-Med only)
EE 51:	Applications of Computers (3)
†Math 30–31:	Precalculus and Single-Variable Calculus I (3)
or	
Math 31:	Single-Variable Calculus I (3)

* Effective fall semester 1981.

† Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

Phys 3: Foundations of Physics (3)
Engl 9 or 10: English Composition: Language as Communication (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Second Semester

BiSc 12: Introductory Biology for Science Majors (4) (Pre-Med only)
EE 52: Computers and Societal Problems (3)
*Math 32: Single-Variable Calculus II (3)
*Math 33: Multivariate Calculus (3)
Phys 14: Introductory Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Chem 13: General Chemistry (4)
Phys 15: Elements of Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

Chem 22: Introductory Quantitative Analysis (3) (Pre-Med only)
ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3) (Except Pre-Med)

Electrical Engineering Curriculum

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
EE 157: Machine and Assembly Language Programming (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse, Digital, and Waveshaping Electronic Design (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

*Math 32 and Math 33 may be taken in a one-semester combined course, Math 32-33.

Seventh Semester

EE 121:	Engineering Electronics and Design (3)
EE 143:	Elements of Communication Engineering Design I (3)
*EE 161:	Electrical Engineering Laboratory (2)
†EE 163:	Senior Electrical Engineering Project Laboratory I (1)
Elective:	Technical electives (9) (three courses selected from EE 113, 13 150, 155, 178; ME 131, 187)
†Elective:	Select one laboratory (1 credit) from CSci 166, EE 166, and 169

Eighth Semester

EE 144:	Elements of Communication Engineering Design II (3)
*EE 162:	Electrical Engineering Laboratory (2)
†EE 164:	Senior Electrical Engineering Project Laboratory II (1)
EE 172:	Control Systems Design (3)
Elective:	Technical electives (5) (two courses selected from EE 116, 1 160, 165, 184; ME 194)
†Elective:	Select one laboratory (1 credit) from EE 146, 176, 186, and C 167

Technical Electives

CSci 166–67:	Computer Science Laboratory I and II (1–1)
EE 113:	Network Analysis and Design (3)
EE 116:	Introduction to Network Synthesis (3)
EE 124:	Electronic Devices (3)
EE 133:	Electromagnetic Waves and Microwave Systems Design (3)
EE 146:	Communications Laboratory (1)
EE 150:	Introduction to Microcomputers (3)
EE 155:	Introduction to Numerical Methods for Computers (3)
EE 160:	Electrical Measurements and Instrumentation (3)
EE 165:	Senior Design Project (2)
EE 166:	Power Systems Laboratory (1)
EE 168:	Microwave and Laser Engineering Laboratory (1)
EE 169:	Advanced Electronics Design Laboratory (1)
EE 178:	Electrical Power Systems (2)
EE 184:	Medical Engineering Instrumentation and Systems Design (3)
EE 186:	Medical Engineering Laboratory (1)
ME 131:	Thermodynamics (3)
ME 187:	Heat Transfer Theory (3)
ME 194:	Energy Conversion (3)

Computer Science Option

Computer science is a developing discipline which combines electronic design, programming of computers, and mathematics into one comprehensive area. The student learns the design and utilization of computers for scientific and business applications. Students who complete this option will be able to design both hardware and software needed for minicomputer and large-scale com-

* Will not be offered after spring semester 1981.
† Effective fall semester 1981.

puting systems. The student will also be competent in hardware and software utilization of computers for control of large systems. The curriculum prepares the student for a career in computer design, applications, and utilization, or to continue study in graduate school.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 118–119.

Fifth Semester

CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods and High Level Languages (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)

Sixth Semester

CSci 153: Design of Switching Systems (3)
CSci 159: Programming and Data Structures (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse and Waveshaping Electronic Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

CSci 150: Introduction to Microcomputers (3)
CSci 151: Introduction to Systems Programming I (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
*CSci 161: Computer Science Laboratory (2)
†CSci 163: Senior Computer Science Project Laboratory (1)
†CSci 166: Computer Science Laboratory I (1)
Elective: Technical elective (3) (one course selected from EE 113, 121, 133, 143; and one course selected from humanities or social sciences (3)

Eighth Semester

CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Systems Programming II (3)
*CSci 162: Computer Science Laboratory (2)
†CSci 164: Senior Computer Science Project Laboratory (1)
†CSci 167: Computer Science Laboratory II (1)
EE 172: Control Systems Design (3)
Elective: Technical elective (3) (one course selected from EE 124, 144, 165, 184)

* Will not be offered after spring semester 1981.
† Effective fall semester 1981.

Technical Electives

EE 113: Network Analysis and Design (3)
EE 121: Engineering Electronics and Design (3)
EE 124: Electronic Devices (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 144: Elements of Communication Engineering Design II (3)
EE 165: Senior Design Project (2)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

Premedical Engineering Option

The Premedical Engineering option will permit the student who completes th work to obtain a bachelor's degree in engineering and have sufficient prepara tion to apply to a medical school for work toward a doctor of medicine degree. The student will also have sufficient background to work in various allied health fields, in the research and development of new electronic equipment used in medicine, or to continue as a graduate student in engineering with ex ceptional qualifications for medical engineering.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 118–119.

Fifth Semester

Chem 151: Organic Chemistry (3)
Chem 153: Organic Chemistry Laboratory (1)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 63: Instrumentation and Networks Laboratory (1)
EE 65: Introductory Electronics Laboratory (1)
EE 157: Machine and Assembly Language Programming (3)

Sixth Semester

Chem 152: Organic Chemistry (3)
Chem 154: Organic Chemistry Laboratory (1)
CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 66: Digital Electronics Design Laboratory (1)
EE 67: Switching Circuits Laboratory (1)
EE 122: Pulse and Waveshaping Electronic Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 161: Electrical Engineering Laboratory (2)
†EE 163: Senior Electrical Engineering Project Laboratory I (1)
†EE 169: Advanced Electronics Design Laboratory (1)
Elective: Selected from humanities or social sciences (6)
Elective: Technical elective (3)

† Effective fall semester 1981.

Eighth Semester

*EE 162: Electrical Engineering Laboratory (2)
†EE 164: Senior Electrical Engineering Project Laboratory II (1)
EE 172: Control Systems Design (3)
EE 184: Medical Engineering and Systems Design (3)
†EE 186: Medical Engineering Laboratory (1)
Elective: Selected from humanities or social sciences (6)
Elective: Technical elective (3)

Technical Electives

Bioc 221–22: General Biochemistry (3–4)
BiSc 145: Introduction to Vertebrate Embryology (4)
BiSc 148: Histology (4)
EE 144: Elements of Communication Engineering Design II (3)

Electrical Engineering Undergraduate Courses‡

11 Linear Networks I (3)

Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15, ApSc 113. (Spring—day and evening; fall—evening) (Kyriakopoulos)

12 Linear Networks II (3)

Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Prerequisite: ApSc 114, EE 11. (Fall—day and evening; spring—evening) (Kyriakopoulos)

20 Introductory Engineering Electronics (3)

Various types of devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Solid-state, vacuum, and gaseous devices. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of graphical techniques. Prerequisite: EE 11. (Fall—day and evening; spring—evening) (Heller)

31 Fields and Waves I (3)

Vector calculus, orthogonal coordinates, Coulomb's and Gauss' laws, scalar potential, dipoles, method of images, dielectrics, capacitance, steady currents, Laplace's and Poisson's equations, boundary-value problems. Prerequisite: Phys 15, 16; ApSc 114. (Fall—day; fall, even years—evening) (Kahn)

32 Fields and Waves II (3)

Biot-Savart law, Ampere's law, vector potential, magnets, Faraday's law, Maxwell's equations, plane waves, and Poynting vector. Prerequisite: EE 31. (Spring—day; spring, odd years—evening) (Kahn)

*Will not be offered after spring semester 1981.
†Effective fall semester 1981.
‡The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

51 Applications of Computers (3) (Same as CSci 51)

Introduction to the solution of problems on a digital computer using FORTRAN or BASIC languages*; data processing concepts and numerical methods using batch or interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. Graduate students needing an introductory course in computers should enroll in EE/CS 100. (Academic year—day and evening) (Feldman)

52 Computers and Societal Problems (3) (Same as CSci 52)

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and information generation and access in time-shared and batch environments using FORTRAN or BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci or EE 51 or equivalent and two years of college preparatory mathematics. (Spring—day and evening) (Bock)

63 Instrumentation and Networks Laboratory (1)

Use of standard electronic equipment in the measurement of electrical and electronic networks. Characteristics of electronic devices. Application of instrumentation to measure basic units of time, frequency, current, voltage, power, and impedance. Use of bridges, oscilloscopes and electronic function generators to measure steady-state and transient phenomena. Replaces former EE 60. Prerequisite or concurrent registration: EE 20, 31. (Fall—day and evening; spring—evening) (Lee)

65 Introductory Electronics Laboratory (1)

Introduction to the charactistics of devices used in electronic design. Design of electronic amplifiers and measurement of their properties. Design and measurement of power supplies. Replaces former EE 60. Prerequisite or concurrent registration: EE 12, 20, 31, 63. (Fall—day and evening; spring—evening) (Lee)

66 Digital Electronics Design Laboratory (1)

Characteristics of electronic devices used in switching, sweeping and waveforming circuits. Generation of waveforms. Digital storage devices and sequential circuits. Characteristics of different methods to produce binary logic gates. Characteristics of integrated circuits. Replaces former EE 61. Prerequisite or concurrent registration: EE 63, 65, 122. (Spring—day and evening; fall—evening) (Meltzer)

67 Switching Circuits Laboratory (1)

Analysis and design of combinational and sequential switching circuits using integrated circuits. Design of decoders, adders, counters, shift registers, character generators and arithmetic circuits. Replaces former EE [illegible]. Prerequisite or concurrent registration: EE 63, 65, 153. (Spring—day and evening; fall—evening) (Meltzer)

100 Introduction to Computer Science (3) (Same as CSci 100)

A more intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN or BASIC language; data processing

* Specific sections of this course will emphasize one or the other language; check schedule of classes at the beginning of each semester. EE and CS majors must select a BASIC section.

concepts, numerical and non-numerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Academic year—evening) (Feldman)

113 **Network Analysis and Design** (3)

Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions, properties of active networks including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. (Fall—day; fall, even years—evening) (Lee)

116 **Introduction to Network Synthesis** (3)

Network functions and their properties. Positive-real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Spring—day; spring, odd years—evening) (Lee)

121 **Engineering Electronics and Design** (3)

Graphical analysis and design beyond the level covered in EE 20. Design of push-pull, direct-coupled and class B and C amplifiers. Design of operational amplifiers and their use in filters and electronic systems. Design of oscillators, active filters, modulators and demodulators. Design of power supplies. Prerequisite: EE 12, 20. (Fall—day and evening) (Heller)

122 **Pulse, Digital, and Waveshaping Electronic Design** (3)

Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flipflops. Concepts in integrated circuit design. Design of counting and timing circuits using IC's. Pulse, sweep and waveshaping circuits. Prerequisite: EE 12, 20. (Spring—day and evening) (Abdalla)

124 **Electronic Devices** (3)

Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of electronic devices and their applications. Modeling of devices such as diodes, transistors, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 12, 32, 121, Phys 16. (Spring—day; spring, odd years—evening) (Heller)

133 **Electromagnetic Waves and Microwave Systems Design** (3)

Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities, Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Fall—day; fall, even years—evening) (Kahn)

143 **Elements of Communication Engineering Design I** (3)

Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency, and pulse modulation. Comparison of analog

and digital transmission. Time and frequency division multiplexing dom signals and noise. Transmission systems for cable, radio, sa and optical links. Prerequisite: EE 121, or concurrent registration 114, or permission of instructor. (Fall—day and evening) (Helger

144 Elements of Communication Engineering Design II (3)

Statistical theory of communication. Comparison of communication tems in noisy channels. Data communications, design of modems. Co of information theory. Coding for noisy channels. ARQ and for error control. Communication protocols. Elements of traffic theory. Sp topics and student project. Prerequisite: EE 143 or permission of ins tor. May be taken for graduate credit by graduate students who are majoring in communications. (Spring—day and evening) (Helgert)

146 Communications Laboratory (1)

Empirical study of several major topics in modern communications periments are chosen from the areas of linear filters, random and p dorandom processes, analog and digital communications, A/D conversa source and channel coding, noise measurements, data security, and c networks. Prerequisite or concurrent registration: EE 12, 32, 63, 65, 1 122, 143, 144, 153. (Spring—day and evening) (Helgert)

150 Introduction to Microcomputers (3) (Same as CSci 150)
(Formerly EE 152)

Introduction to the structure of microprocessors and microcomputer Representation of information in the computer. Logic and storage d vices. Processor structure, registers, transfer of information and cont Programming in microcomputers. I/O structure and auxiliary electron Interrupt structures, direct memory access. LSI and its implication microcomputers. Arithmetic operations. Different microcomputer arch tectures. Prerequisite: CSci 153 or permission of instructor. (Fall—da and evening) (Friedman)

151 Introduction to Systems Programming I (3) (Same as CSci 151)

Concepts and use of macro-assemblers and conditional assembly. Con trol of I/O via access methods. Job control languages and file structure File and storage management. Use of linkers and loaders to create loa modules. Prerequisite: EE 157 and 159. (Fall—day; fall, odd years—e evening) (Feldman)

153 Design of Switching Systems (3) (Same as CSci 153)

Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and code encoders and decoders, logic and electronic design of functional digi units. Use of LSI in logic design. Introduction to sequential circuits Minimization of sequential machines. Design of synchronous, asynch nous and pulse sequential circuits. State-assignment and covers. Ma taken for graduate credit by graduate students who are not majoring computer science or computer heuristics, modeling, and numerical me ods. (Spring—day and evening; fall—evening) (Friedman)

154 Digital Computer Design (3) (Same as CSci 154)

Logic and electronic design of functional digital units. Design of digi computer subsystems, flow of information and logical flow diagrams. timing and control signals. Design of binary and decimal, serial and par allel digital arithmetic units. Design of memory subsystems, channels, I/O and storage subsystems. Design of the control unit of a digital computer

Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci or EE 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening; fall—evening) (Abdalla)

155 **Introduction to Numerical Methods for Computers** (3) (Same as CSci 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci/EE 51; or equivalent. (Fall—day; fall, even years—evening) (Meltzer)

156 **Introduction to Systems Programming II** (3) (Same as CSci 156)

Concepts of an operating system, monitors, dispatchers, initiators and control programs. Control of task, job stream and secondary storage. Memory management, interrupt handling, device management and scheduling algorithms. Concurrent processes. Performance evaluation in a multi-programmed environment. Prerequisite: CSci 151. (Spring—day; spring, even years—evening) (Hoffman)

157 **Machine and Assembly Language Programming** (3)(Same as CSci 157)

Programming of microcomputers, minicomputers, and large-scale computers in machine and assembly language. Number systems and codes. Architecture of various digital computers. Methods of addressing and machine control for fixed- and variable-word-length computers. Programming on a stack architecture computer. Input-output control. Timing and benchmarking techniques. Prerequisite: CSci/EE 51 or equivalent. May be taken for graduate credit by graduate students who are not majoring in computer science or computer heuristics, modeling, and numerical methods. (Fall—day and evening; spring—evening) (Bock)

158 **Algorithmic Methods and High-Level Languages** (3) (Same as CSci 158)

Structure, application, and comparison of high-level programming languages. List structures. Recursive procedures. Structured programming. Top-down program design. Team-programming techniques. Meta-syntactical techniques. Introduction to parsing and compiling. String processing. Turing and Markov algorithms. Performance evaluation and benchmarking techniques. Prerequisite: CSci/EE 51. Fall—day and evening; spring—evening) (Bock)

159 **Programming and Data Structures** (3) (Same as CSci 159)

Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting, searching, hashing and merging of data files. List and string processing languages. Prerequisite: CSci 157, 158. May be taken for graduate credit by graduate students who are not majoring in computer science or computer heuristics, modeling, and numerical methods. (Spring—day and evening) (Feldman)

160 **Electrical Measurements and Instrumentation** (3)

Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, induct-

ance, energy, phase angle, frequency, and time. Measurements of frequency signals including field strength, signal-to-noise ratio, impedance and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instruments. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121, 150. (Spring—evening) (H

*161–62 **Electrical Engineering Laboratory** (2–2)

Experiments in support of courses in networks, electronics, microwaves, computers, communications, controls, and machines. The student is required to begin a design project in EE 161 and complete it in EE 162. Prerequisite or concurrent registration: EE 61, 113, 122; CSci/EE EE 161 is prerequisite to EE 162. (Academic year—day and evening) (Meltzer)

†163 **Senior Electrical Engineering Project Laboratory I** (1)

The student will conceive and design a one-year project which will be completed in EE 164. As part of the project the student must perform a market survey and economic analysis of the product. The student will complete the preliminary design in this semester. Prerequisite or concurrent registration: EE 32, 63, 65, 122, 153, 177 and senior status. (Fall—day and evening) (Meltzer)

†164 **Senior Electrical Engineering Laboratory II** (1)

The student will complete and construct the project which was started in EE 163. The student will make both an oral and written presentation of the product designed. Prerequisite: EE 163. (Spring—day and evening) (Meltzer)

165 **Senior Design Project** (2)

The student will conceive, design, construct, and test an original project in hardware or software. He will write a complete report including schematic diagrams and repair procedures, if applicable. This project cannot be used to satisfy the project required in EE 161–62. Prerequisite: senior status. (Spring—day) (Pickholtz)

†166 **Power Systems Laboratory I** (1)

Experiments in support of the analysis and design of electrical power systems. Measurements of the characteristics of newer devices to generate electricity. Fault analysis on electrical machines. Prerequisite or concurrent registration: EE 32, 177, 178. (Fall—day and evening) (Harrington)

†168 **Microwave and Laser Engineering Laboratory** (1)

Experiments in support of analysis and design of transmission lines, microwave components, microwave systems, fiber-optic systems, antennas and antenna arrays. Introduction to the characteristics of laser and optical systems. Prerequisite or concurrent registration: EE 63, 66, 133. —day and evening) (Kahn)

†169 **Advanced Electronics Design Laboratory** (1)

Experiments in support of the theory of the analog operation of electronic devices. Characteristics of nonlinear operation of electronic devices. Use of electronic devices in communication equipment. Prerequisite or concurrent registration: EE 20, 63, 65, 121, 143. (Fall—day and evening) (Heller)

* Will not be offered after spring semester 1981.
† Effective fall semester 1981.

172 Control Systems Design (3)

Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114; and EE 12 or ME 134. (Spring—day and evening) (Kyriakopoulos)

***176 Control Systems Laboratory (1)**

Experiments in support of control theory. Characteristics of control components. Control components in feedback systems. Effects of nonlinearity on control systems. Prerequisite or concurrent registration: EE 12, 20, 63, 65, 113, 172. (Spring—day and evening) (Carroll)

177 Electrical Energy Conversion (3)

Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase a-c rotating machines, d-c machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Spring—day; spring, even years—evening) (Harrington)

178 Electrical Power Systems (2)

Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis by digital computer. Load-flow studies, economic considerations. Power station designs and synchronization of generators. Methods of generating electrical power. Prerequisite: EE 177, senior status. (Fall—evening) (Harrington)

184 Medical Engineering Instrumentation and Systems Design (3)

Designed to introduce the engineering or physical sciences student to the applications of engineering design in the medical sciences; terminology of the medical profession emphasized; the physiology of the human body presented from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit except by medical engineering majors. Admission by permission of instructor. (Spring—evening) (Eisenberg)

***186 Medical Engineering Laboratory (1)**

Experiments in support of instrumentation used in medicine and biology. Measurement of physiological signals, EKG, EEG, and evoked potentials. Processing of signals derived from physiological measurements. Concepts in telemetry of medical signals. Prerequisite or concurrent registration: EE 12, 32, 66, 121, 184. (Spring—day and evening) (Loew)

198 Research (including Honors Research Seminar) (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

Computer Science Undergraduate Courses

51 Applications of Computers (3) (Same as EE 51)

Introduction to the solution of problems on a digital computer using FORTRAN or BASIC languages†; data processing concepts and numerical

*Effective fall semester 1981
†Specific sections of this course will emphasize one or the other language; check schedule of classes for the beginning of each semester. EE and CS majors must select a BASIC section.

methods using batch or interactive time-shared terminal computer s tems; writing, debugging, and running programs on various digital c puter systems. Graduate students seeking a first course in compu should enroll in EE/CSci 100. (Academic year—day and even (Bock)

52 Computers and Societal Problems (3) (Same as EE 52)

Application of the digital computer to the analysis and synthesis physical, social, cultural, economic, and environmental processes systems. Software methods for simulation, graphic display, data red tion, and file generation and access in time-shared and batch envir ments using FORTAN or BASIC. Computer-related societal proble and processes. Group projects emphasizing research and investigat techniques applied to student-selected interests. Prerequisite: CSci/EE or equivalent; two years of college preparatory mathematics. (Spring day and evening) (Bock)

100 Introduction to Computer Science (3) (Same as EE 100)

A more intensive introductory course for students with a science, mat matics, or other quantitative background. Solution of problems on digital computer using FORTRAN or BASIC language; data processi concepts, numerical and non-numerical methods using batch or intera tive time-shared terminal computer systems. Writing, debugging, and ru ning programs on various digital computer systems. Recommended fo graduate and advanced undergraduate students in other departments Prerequisite: Math 32 or equivalent. (Academic year—evening) (Feld man)

150 Introduction to Microcomputers (3) (Same as EE 150)
(Formerly CSci 152)

Introduction to the structure of microprocessors and microcomputer Representation of information in the computer. Logic and storage de vices. Processor structure, registers, transfer of information and control Programming in microcomputers. I/O structure and auxiliary electronics Interrupt structures, direct memory access. LSI and its implication fo microcomputers. Arithmetic operations. Different microcomputer archi tectures. Prerequisite: CSci 153 or permission of instructor. (Fall—day and evening) (Friedman)

151 Introduction to Systems Programming I (3) (Same as EE 151)

Concepts and use of marco-assemblers and conditional assembly. Capa of I/O via access methods, Job control languages and files structures File and storage management. Use of linkers and loaders to create loa modules. Prerequisite: CSci 157, 159. (Fall—day; fall, odd years evening) (Feldman)

153 Design of Switching Systems (3) (Same as EE 153)

Introduction to switching logic and combinational circuits. Analysis switching devices. Minimization techniques. Number systems and codes encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchro nous and pulse sequential circuits. State-assignment and covers. May not taken for graduate credit except by majors in computer science or com puter heuristics, modeling, and numerical methods. (Spring—day and evening; fall—evening) (Friedman)

154 Digital Computer Design (3) (Same as EE 154)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals. Design of binary and decimal, serial and parallel digital arithmetic units. Design of memory subsystems, channels, I/O, and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening; fall—evening) (Abdalla)

155 Introduction to Numerical Methods for Computers (3) (Same as EE 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci or EE 51; or equivalent. (Fall—day; fall, even years—evening) (Meltzer)

156 Introduction to Systems Programming II (3) (Same as EE 156)

Concepts of an operating system, monitors, dispatchers, initiators and control programs. Control of task, job stream and secondary storage. Memory management, interrupt handling, device management and scheduling algorithms. Concurrent processes. Performance evaluation in a multi-programmed environment. Prerequisite: CSci 151. (Spring—day; spring, even years—evening) (Hoffman)

157 Machine and Assembly Language Programming (3) (Same as EE 157)

Programming of microcomputers, minicomputers, and large-scale computers in machine and assembly language. Number systems and codes. Architecture of various digital computers. Methods of addressing and machine control for fixed- and variable-word-length computers. Programming on a stack architecture computer. Input-output control. Timing and benchmarking techniques. Prerequisite: CSci/EE 51 or equivalent. May be taken for graduate credit by graduate students who are not majoring in computer science or computer heuristics, modeling, and numerical methods. (Fall—day and evening; spring—evening) (Bock)

158 Algorithmic Methods and High-Level Languages (3) (Same as EE 158)

Structure, application, and comparison of high-level programming languages. List structures. Recursive procedures. Structured programming. Top-down program design. Team-programming techniques. Meta-syntactical techniques. Introduction to parsing and compiling. String processing. Turing and Markov algorithms. Performance evaluation and benchmarking techniques. Prerequisite: CSci/EE 51. (Fall—day and evening; spring—evening) (Bock)

159 Programming and Data Structures (3) (Same as EE 159)

Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting,

searching, hashing and merging of data files. List and string proce languages. Prerequisite: CSci/EE 157, 158. May be taken for gra credit by graduate students who are not majoring in computer scienc computer heuristics, modeling, and numerical methods. (Spring and evening) (Feldman)

•161–62 Computer Science Laboratory (2–2)

Experiments in support of digital logic, electronics, systems and softw Use of integrated circuits and microprocessors to develop digital syst Interfacing I/O equipment to computers. Analog computing, hybrid co puting, and A-to-D converters. The student begins a design project CSci 161 and completes it in CSci 162. CSci 161 is prerequisite to C 162. Prerequisite or concurrent registration: EE 61, 122; CSci 153, 1 158. (Academic year—day and evening) (Meltzer)

†163 Senior Computer Science Project Laboratory I (1)

The student will conceive and design a one-year project in hardware a or software which will be completed in CSci 164. As part of the proj the student must perform a market survey and economic analysis of product. The student will complete the preliminary design in this sem ter. Prerequisite or concurrent registration: EE 63, 65, 122, 153, 157, 15 159 and senior status. (Fall—day and evening) (Abdalla)

†164 Senior Computer Science Project Laboratory II (1)

The student will complete and construct the project which was started CSci 163. The student will make both an oral and written presentat of the product designed. Prerequisite: CSci 163. (Spring—day a evening) (Abdalla)

†166 Computer Science Laboratory I (1)

Experiments in support of the theory and design of micro-processor a microcomputer hardware and software. Use of microprocessors in contr of systems. Use of simulators, cross-compilers and development systems Prerequisite or concurrent registration: EE 63, 65, 66, 67, 122; CSci 15 153, 157. (Fall—day and evening) (Abdalla)

†167 Computer Science Laboratory II (1)

Experiments in support of the design of digital computing systems. De sign of memory, control and arithmetic units. Input and output in a com puter. Software experiments to support the operating system for a sm computer. Prerequisite or concurrent registration: CSci 151, 154, 156, 15 158, 159, 166; EE 66, 67. (Spring—day and evening) (Abdalla)

198 Research (including Honors Research Seminar) (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite junior or senior status. (Fall and spring)

GRADUATE STUDY

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of maturity and basic knowledge one of the most stimulating experiences for advanced study. The Department offers stud

• Will not be offered after spring semester 1981.
† Effective fall semester 1981.

ading to the Master of Science, Professional, and Doctor of Science degrees. The student may study in an area of concentration such as Systems Science, etworks, and Controls; Electrophysics (electronics, fields, and waves); Com-unications; Medical Engineering; Computer Science (hardware, software, and stems); Computer Heuristics, Modeling, and Numerical Methods; Energy nversion, Power, and Transmission; or Telecommunications and Computers. The graduate programs are formulated to take into consideration the stu-ent's individual strengths, skills, aspirations, and abilities and are determined rough consultation by the student with the faculty adviser. The program hould provide the student with a thorough understanding of the area of con-entration and with a breadth of knowledge necessary in modern engineering nd computer science. Each graduate student is assigned a faculty adviser on he basis of study interests, helping to develop a close student-faculty relation-hip during the course of the program.

Colloquium Requirement: Graduate students are required to attend several epartment colloquia each semester. These are intended to broaden the stu-ent's professional outlook and to encourage interaction with the faculty. chedules are posted.

The graduate programs are also designed to provide an educational service the Washington technical community. Many courses have been developed fter consultation with private industry and government agencies in the area. substantial number are offered both during the afternoon and evening and lternate from year to year.

The Department of Electrical Engineering and Computer Science has con-nuously kept the graduate program up to date through contact with recent evelopments, research generated within the Department, and the addition of xperts in appropriate fields who serve as part-time and adjunct faculty.

The Department of Electrical Engineering and Computer Science periodically ublishes a detailed brochure to supplement the present catalogue with informa-ion about procedures, requirements, regulations, and scope of its graduate pro-rams. Special pamphlets describing specific programs are also available.

reas of Concentration

OMMUNICATIONS

EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 208: Digital Image Processing
EE 241: Information Theory
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 245: Signal Detection and Estimation Theory
EE 246: Digital Communications
*EE 247: Communication Systems
EE 248: Data Communication Systems
EE 249: Theory of Data- and Computer-Communication Networks
EE 252: Digital Signal Processing Techniques

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

EE 253:	Sonar Systems
EE 254:	Radar Systems
EE 257:	Secure Communications
*EE 258:	Radio Communication Systems I
*EE 259:	Radio Communications Systems II
*EE 277:	Satellite Communication Systems
EE 298:	Research
EE 299-300:	Thesis Research
*EE 345:	Advanced Detection Theory
*EE 346:	Communications Switching and Traffic Theory
EE 347:	Data Communications
EE 349:	Communications Research
EE 399:	Dissertation Research

COMPUTER HEURISTICS, MODELING, AND NUMERICAL METHODS

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
CSci 201:	Introduction to Computer Systems
CSci 203:	Microprocessors and Microcomputers
CSci 213:	Discrete Structures in Computing
CSci 215:	Advanced Data Structures
CSci 219:	Interactive Computer Graphics I
*CSci 220:	Pattern Recognition
CSci 223:	Simulation and Heuristics
CSci 224:	Artificial Intelligence
CSci 231:	Sequential Machines
*CSci 232:	Automata and Formal Languages
CSci 278:	Analog and Hybrid Computers
CSci 281:	Applications of Numerical Methods I
CSci 282:	Applications of Numerical Methods II
CSci 285:	Approximation of Functions and Data Representations
*CSci 286:	Numerical Methods in Engineering I
*CSci 287:	Numerical Methods in Engineering II
*CSci 288:	Numerical Methods in Engineering III
*CSci 289:	Numerical Methods in Engineering IV
CSci 319:	Interactive Computer Graphics II

COMPUTER SCIENCE (HARDWARE, SOFTWARE, AND SYSTEMS)

CSci 201:	Introduction to Computer Systems
CSci 203:	Microprocessors and Microcomputers
CSci 208:	Computer Programming
CSci 213:	Discrete Structures in Computing
CSci 215:	Advanced Data Structures
CSci 216:	Information Retrieval Systems
CSci 219:	Interactive Computer Graphics I
*CSci 220:	Pattern Recognition
CSci 222:	Design of User-Computer Dialogues
CSci 223:	Simulation and Heuristics
CSci 224:	Artificial Intelligence

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

CSci 227: Management Information Systems and Data Base Management
CSci 229: Security and Privacy in Computer Systems
CSci 231: Sequential Machines
CSci 232: Automata and Formal Languages
CSci 237: Computing Systems
*CSci 239: Comparative Computer Systems
*CSci 240: Theory and Practice of Microprogramming
CSci 243: Fault Tolerant Systems and Design Automation
CSci 244: Data Communications
*CSci 245: Advanced Computer Systems Theory I
*CSci 246: Advanced Computer Systems Theory II
*CSci 255: Analysis and Correctness of Algorithms
*CSci 256: Design of Translators
*CSci 258: Advanced Programming Languages
CSci 263: Digital Computer Programming Systems
*CSci 267: Operating Systems I
*CSci 268: Operating Systems II
CSci 278: Analog and Hybrid Computers
CSci 298: Research
CSci 299-300: Thesis Research
*CSci 319: Interactive Computer Graphics II
CSci 391: Computer Science Research
CSci 399: Dissertation Research

ELECTROPHYSICS (ELECTRONICS, FIELDS, AND WAVES)

EE 201: Natural Modes and Transients in Electrical Systems
EE 206: Electromagnetic Theory and Applications I
EE 207: Electromagnetic Theory and Applications II
EE 221: Physical Electronics I
EE 222: Physical Electronics II
EE 223: Optical Communications Systems
*EE 224: Electronics of Lasers
EE 225: Nonlinear Electronics
*EE 226: Fiber and Integrated Optics
EE 227: Industrial Electronics
EE 228: High-frequency Electronics
EE 231: Field Analysis and Potential Theory
*EE 232: Electrodynamics
EE 233: Microwaves and Components
*EE 234: Electromagnetic Wave Propagation
EE 235: Antennas
*EE 236: Plasma Dynamics
*EE 237: Waves in Random Media
EE 238: Remote Sensing
EE 239: Numerical Laboratory in Electromagnetics
EE 255: Optical Processing
EE 298: Research
EE 299-300: Thesis Research
EE 321: Approximate Mathematical Techniques for Electromagnetics
EE 322: Advanced Waveguide Diffraction and Design
*EE 323: Principles of Microelectronics
EE 329: Electrophysics Research
EE 399: Dissertation Research

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

ENERGY CONVERSION, POWER, AND TRANSMISSION

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear System Theory I
EE 206: Electromagnetic Theory and Applications I
EE 212: Advanced Network Analysis
EE 227: Industrial Electronics
EE 261: Electromechanical Energy Conversion
EE 264: Direct Electrical Energy Conversion
EE 265: Electrical Power Production
EE 266: Electrical Power Transmission and Distribution
EE 267: Power Networks
EE 269: Issues in Electrical Power Systems

MEDICAL ENGINEERING

EE 280: Introduction to Medicine for Engineers I: Physiology and Anat
EE 281: Introduction to Medicine for Engineers II: Clinical Medicine
EE 282: Medical Instrumentation I
EE 283: Medical Instrumentation II
EE 285: Sensory-evoked Potentials I
EE 287: Engineering in Physical Medicine and Rehabilitation
*EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
*EE 380: Bioelectric Phenomena
*EE 381: Computer-aided Analysis of Physiological Signals
*EE 382: Physiological Controls and Systems
*EE 385: Sensory-evoked Potentials II
EE 389: Medical Engineering Research
EE 399: Dissertation Research

SYSTEMS SCIENCE, NETWORKS, AND CONTROLS

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear System Theory I
EE 203: Linear System Theory II
EE 212: Advanced Network Analysis
*EE 213: Computer-aided Analysis and Design of Networks
*EE 215: Linear Network Synthesis I
*EE 216: Linear Network Synthesis II
EE 272: Discrete Systems
EE 273: System Optimization
*EE 274: Nonlinear Systems
*EE 275: System Identification and Adaptive Systems
EE 276: Cybernetics
EE 278: Spacecraft Systems Design
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks and Controls Research
*EE 371: Simulation Methods for System Analysis
*EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

ELECOMMUNICATIONS AND COMPUTERS

EE 144: Elements of Communication Engineering Design II
EE 204: Stochastic Signals and Noise
EE 205: Stochastic Processes in Electrical Engineering
EE 242: Coding Theory
EE 243: Communication Theory I
EE 244: Communication Theory II
EE 246: Digital Communications
EE 249: Data Telecommunications Networks I
EE 257: Issues in Computer Communications
EE 346: Communication Switching and Traffic Theory
EE 348: Data Telecommunications Networks II
CSci 159: Programming and Data Structures
CSci 201: Introduction to Computer Systems
CSci 214: Data Structures
CSci 216: Information Retrieval Systems
CSci 227: Management Information Systems and Data Base Management
CSci 229: Security and Privacy in Computer Systems
CSci 244: Data Communications
CSci 263: Digital Computer Programming Systems
CSci 267: Operating Systems I
CSci 268: Operating Systems II
EAd 211-12: Engineering Administration
EAd 261: Economic Analysis in Engineering Planning
EAd 262: Finance for Engineers
EAd 269: Elements of Decision-Making and Problem-Solving
EAd 281: Systems Analysis and Management I
EAd 292: Structural Analysis of Management Problems

ASTER OF SCIENCE DEGREE PROGRAM

he Department of Electrical Engineering and Computer Science offers grad- te study leading to the degree of Master of Science in the following areas of ncentration. Faculty members who may serve as advisers are listed after ch area.

1. Communications (Braun, Helgert, Heller, Lang, Pickholtz)
2. Computer Heuristics, Modeling, and Numerical Methods (Abdalla, ock, Feldman, Foley, Hoffman, Loew, Maurer, Meltzer, Zaghloul)
3. Computer Science (hardware, software, and systems) (Abdalla, Berko- tzer, Bock, Feldman, Foley, Friedman, Hoffman, Kyriakopoulos, Maurer, Merwin, Zaghloul)
4. Electrophysics (electronics, fields, and waves) (Braun, Eisenberg, Heller, nn, Lang)
5. Energy Conversion, Power, and Transmission (Harrington, Kahn, Lang, tzer)
6. Medical Engineering (Eisenberg, Loew)
7. Systems Science, Networks, and Controls (Carroll, Kyriakopoulos, Lee, ltzer, Zaghloul)
8. Telecommunications and Computers (Helgert, Hoffman, Meltzer, Pick- olz; Shane, Steiner (Engineering Administration))

There are no required courses or programs of study in any of the areas of oncentration. Each student formulates an individualized program in consulta- on with the assigned faculty adviser.

Admission

In addition to the general requirements, the applicant must have m
admission to graduate study (see page 27). Applicants for Master of S
programs in the Department of Electrical Engineering and Computer S
must meet the following general and specific requirements. The trans
credit regulations (see page 28) apply as well to courses taken as a non-
student through the Division of University and Summer Students at
Washington University.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairm
the Department of Electrical Engineering and Computer Science.

2. The applicant must have at least a quality-point index of 2.50 (
scale with 4.00 maximum), or equivalent, for the last 60 semester hou
undergraduate work.

3. The applicant must be adequately prepared in the basic sciences (phy
and chemistry or biology) and in mathematics (calculus through differe
equations).

SPECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have suc
through undergraduate studies the following specific requirements according
the area of concentration:

Communications

1. Networks with applications using Laplace transforms (6 semester hours
EE 11 and 12; or equivalent)

2. Electronics (3 semester hours—EE 20; or equivalent)

3. Communication theory (3 semester hours—EE 143; or equivalent

Computer Heuristics, Modeling, and Numerical Methods

1. Computer programming using FORTRAN (3 semester hours—CSci 5
or equivalent)

2. Mathematics including partial differential equations, matrices, and eig
value problems

3. Probability and statistics (3 semester hours—ApSc 115; or equivalent

Computer Science

1. Computer programming using FORTRAN (3 semester hours—EE
or equivalent)

2. Computer hardware and computer software (6 semester hours—CSci
and CSci 157; or equivalent)

Electrophysics

1. Networks with applications using Laplace transforms (6 semester hou
EE 11 and 12; or equivalent)

2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20 and 121; or equivalent)
3. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)

nergy Conversion, Power, and Transmission

1. Network analysis using Laplace transforms (6 semester hours—EE 11 nd 12; or equivalent)
2. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177; or equivalent)

edical Engineering

Either:

1. Network theory (3 semester hours—EE 11; or equivalent)
2. Electronic circuits (6 semester hours—EE 20 and 121; or equivalent)

Or:

1. Computer programming (3 semester hours—CSci 51; or equivalent)
2. Computer hardware and software (6 semester hours—CSci 153 and 157; equivalent)

ystems Science, Networks, and Controls

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, and 113; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Control theory (3 semester hours—EE 172; or equivalent)

elecommunications and Computers

1. Communication theory (3 semester hours—EE 143; or equivalent)
2. Computer Science (6 semester hours—CSci 51 and either CSci 150 or CSci 157; or equivalent)

In cases where some undergraduate deficiencies exist, the student may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a graduate student.

rogram of Study

pon admission to the Master of Science degree program, the graduate student is assigned a faculty adviser. In consultation, the student and faculty adviser formulate the program of study and complete the form "Graduate Program of Studies" (Form 1) for submission to the Department Chairman for approval. This form should be completed prior to or at the student's first registration. During consultation, the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree will consist of a minimum of 24 semester credit hours of graduate-level courses and 6 semester hours of thesis; or, for the nonthesis option, a minimum of 33 credit hours of graduate-level courses. With the thesis, a minimum of 12 credit hours must be

in the major field of concentration, and no less than three graduate courses must be in areas other than the student's area of concentration (major). For the nonthesis option, a minimum of 21 credit hours must be in the major field, and no less than three courses must be in areas other than the student's major area.

A maximum of three courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year. On the prescribed form, and prior to the deadline, students must notify the Department of their intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day, and the student is asked to solve several problems relating to the subject matter of his major area of study. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is not limited to those specific courses which the student has taken, but is designed to demonstrate the student's ability to integrate material from several course areas as well as to learn from the readings.

A student who fails the Master's Comprehensive Examination on his first attempt may be re-examined one more time if approval is given by the appropriate examining committee. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

PROFESSIONAL DEGREE PROGRAM

The Department of Electrical Engineering and Computer Science offers graduate study leading to a Professional degree. This program is for students who are interested in pursuing course work beyond the Master's degree with emphasis on applied subject material rather than on research. Successful completion of the Professional degree program leads to the degrees of Engineer or Applied Scientist. Students may study for the Professional degree in the following areas of concentration. Communications; Computer Science (hardware, software, and systems); Electrophysics (electronics, fields, and waves); Medical Engineering; Systems Science, Networks, and Controls; Energy Conversion, Power, and Transmission; and Computer Heuristics, Modeling, and Numerical Methods.

There are no formal required courses or programs of study in any of the areas of concentration for the Professional degree. Each student formulates an individualized program in consultation with the assigned faculty advisor.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward a Professional degree (see pages 31-

applicants for the Professional degree programs in the Department of ectrical Engineering and Computer Science must meet the following general d specific requirements.

ERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of e Department of Electrical Engineering and Computer Science.
2. The applicant must have a quality-point index of at least 3.0 (on a scale 4.0 maximum), and two years of professional experience after obtaining the ster's degree.
3. The applicant must be adequately prepared in the basic sciences (physics, chemistry or biology) and in mathematics (calculus through differential ations).

CIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have satisfied ough previous studies the following specific requirements according to the of concentration:

munications

ine semester hours of statistical theory of communication and 3 semester rs of information theory—EE 204, 241, 243, and 244; or equivalent.

puter Heuristics, Modeling, and Numerical Methods

Twelve semester hours of computer science and numerical methods at the duate level—CSci 201, 223, and 281; or equivalent.

puter Science

welve semester hours of computer system design and software beyond the of a compiler language—CSci 201 and 213; or equivalent.

trophysics

welve semester hours of physical electronics and electromagnetics at the duate level—EE 201, 206, 207, and 221; or equivalent.

rgy Conversion, Power, and Transmission

ine semester hours of electrical machine theory and networks at the grad- level—EE 202, 261, and 266; or equivalent.

dical Engineering

welve semester hours of medical engineering at the graduate level—EE 281, 282 and 283; or equivalent.

ems Science, Networks, and Controls

welve semester hours of network system analysis at the graduate level, in- ing a knowledge of state space and linear graph theory—EE 201, 202, 203, 273, or equivalent.

n applicant who fails to meet the above specific requirements, but meets ther admission requirements, may be admitted with a program of study h is increased beyond the minimum requirements so that sufficient back- nd material may be covered.

Program of Study

Upon admission to the Professional degree program, the student is assigned a faculty adviser. Together they will formulate a program of study for the student which must contain a minimum of 30 semester hours of courses, and complete the form "Graduate Program of Study." Programs of study and subsequent changes must be approved by both the faculty adviser and the Department Chairman.

The program of study for the Professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major area but in support of the student's program. A student who is changing the major area from that studied for the Master's degree or who is lacking the specific requirements needed for admission may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

DOCTOR OF SCIENCE PROGRAM

The Department of Electrical Engineering and Computer Science offers programs of graduate study leading to the degree of Doctor of Science in the areas of concentration listed below. There are no formal required courses or programs of study in the areas listed. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser.

Special fields of each faculty member are listed below.

ABDALLA, A.—Professor of Engineering and Applied Science.
Digital Computer Systems; Time-sharing Systems; Logical Design of Switching Circuits; Microprocessors.

BERKOVICH, S.—Associate Professor of Engineering and Applied Science.
Information Systems; Data Structures; Associative Memories and Processors.

BOCK, P.—Special Lecturer in Engineering.
Computer Science; Simulation; Programming Languages; Microprocessor Systems.

BRAUN, E.H.—Associate Professor of Engineering and Applied Science.
Antenna Theory; Coding Theory; Physical Electronics.

CARROLL, R.L.—Associate Professor of Engineering and Applied Science.
Control Theory; Adaptive Systems.

EISENBERG, M.F.—Professor of Engineering and Applied Science.
Medical Engineering; Thermography; Evoked Response; Ultrasonics.

FELDMAN, M.B.—Associate Professor of Engineering and Applied Science.
Computer Science, Automata Theory; Programming Languages.

FOLEY, J.D.—Associate Professor of Engineering and Applied Science.
Interactive Computer Graphics; System Modeling and Measurement; Human Factors of the Man-Machine Interface; Distributed Processing and Networking.

FRIEDMAN, A.D.—Professor of Engineering and Applied Science.
Computer Architecture and Organization; Switching Theory and Logic Design; Microprocessors; Diagnosis and Fault Tolerant Design of Digital Circuits; Digital System Design Automation.

HARRINGTON, R.J.—Adjunct Associate Professor of Engineering.
Simulation and Control of Electrical Machinery and Power Systems; Transient Stability; Transmission Line Switching Transients; Computer Modeling.

HELGERT, H.—Professor of Engineering and Applied Science.
Communication and Information Theory; Coding Theory.

HELLER, R.B.—Professor of Engineering and Applied Science.
Information Processing; Computer-to-Computer Communication Networks; Satellite Communications; Electromagnetic Radiation.

HOFFMAN, L.J.—Associate Professor of Engineering and Applied Science.
Computer Science; Security and Privacy; Criminal Justice Information Systems; Social Implications.

KAHN, W.K.—Professor of Engineering and Applied Science.
Antennas; Microwave Components; Fiber Optics; Electrophysics.

KING, W.—Senior Scientist.
Signal Processing; Applications to Radar.

KYRIAKOPOULOS, N.—Associate Professor of Engineering and Applied Science.
Computer-Aided Network Design; System Theory; Control Theory; Digital Filtering.

LANG, R.H.—Professor of Engineering and Applied Science.
Wave Propagation in Random Media; Remote Sensing; Phase-Locked Loops; Adaptive Arrays.

LEE, T.N.—Associate Professor of Engineering and Applied Science.
Networks; Linear Systems.

LOFEW, M.H.—Associate Professor of Engineering.
Pattern Recognition; Medical Engineering; Signal Processing.

MAURER, W.D.—Professor of Engineering and Applied Science.
Computer Science, Correctness of Programs, Analysis of Algorithms; Semantics of Programming Languages.

MELTZER, A.C.—Professor of Engineering and Applied Science.
Design of Computer Systems; Data Base Systems; Multiprocessor Systems; Hybrid Computation.

MERWIN, R.E.—Research Professor.
Microprogramming; Special-Purpose Computer Languages; Automatic Test Systems; Distributed Data Processing Systems.

MICKHOLTZ, R.L.—Professor of Engineering and Applied Science.
Data Communications, Computer Communications Networks; Communications Theory.

MIGHLOUL, M.—Assistant Professor of Engineering.
Linear and Nonlinear Networks and Systems; Computer-Aided Network Analysis and Design; Computer Science; Programming Languages; Analysis of Algorithms.

Admission

In addition to the School of Engineering and Applied Science requirements
admission to graduate study toward the Doctor of Science degree (see p
34), applicants for the Doctor of Science degree in the Department
Electrical Engineering and Computer Science must meet the following gen
and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman
the Department of Electrical Engineering and Computer Science.
2. The applicant must have a minimum quality-point index of 3.20 (on
scale of 4.00 maximum), or equivalent, in graduate course work leading to
Master's degree.
3. The applicant must be adequately prepared in the basic sciences (physics
and chemistry or biology) and in mathematics (calculus through differential
equations).

SPECIFIC REQUIREMENTS

In addition to the above general requirements, the applicant must also give
through previous studies the following specific requirements according to the
area of concentration (major area):

Communications

Nine semester hours of statistical theory of communication and 3 semester
hours of information theory—EE 204, 241, 243, and 244; or equivalent.

Computer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of numerical methods at the graduate level—CSci
201, 223, and 281; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond the
use of a compiler language—CSci 201 and 213; or equivalent.

Electrophysics

Twelve semester hours of electronics and electromagnetic fields and waves at
the graduate level—EE 201, 206, 207, and 221; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—BE
280, 281, 282, and 283; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours in network system analysis at the graduate level, in-
cluding a knowledge of state space and linear graph theory—EE 201, 202, 203,
and 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets
all other admission requirements, may be admitted with a program of study
which is increased beyond the minimum requirements so that sufficient back-
ground material may be covered for doctoral studies.

Program of Study

At the time of admission, the graduate student in pursuit of a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser, the student will determine the two minor areas of study and the foreign language important in the student's field of study. Together they will formulate a program of study for the student leading to the Qualifying Examination and complete the form "Graduate Program of Study" (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and Department Chairman.

MAJOR AREA

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas totaling a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the Master's degree level. A minimum of 15 semester hours must be taken in the major area; a minimum of three courses designated with an asterisk in the list of areas of concentration must be included as part of the major area. A student who is changing the major area from that studied for the Master's degree or who is missing specific admission requirements may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

MINOR AREAS

The student in consultation with the faculty adviser formulates a program of study which includes two minor areas as part of the total doctoral studies. For those students who take their minor area studies within the Department of Electrical Engineering and Computer Science, the following courses specify adequate programs in each minor area:

Communications—EE 204; 205 or 241; 243; and 244 or 249

Computer Heuristics, Modeling and Numerical Methods—CSci 201, 223, and 281

Computer Science—CSci 201, 213, and 237 or 263

Electrophysics—EE 201, 206, 207, and 221

Energy Conversion, Power, and Transmission—EE 202, 261, 264, and 265

Medical Engineering—EE 280, 281, 282, and 283

Systems Science, Networks, and Controls—EE 202, 203, 212, and 273

Minor areas are not confined to the Department of Electrical Engineering and Computer Science, but may be taken from other departments within the University such as Mathematics, Statistics, Operations Research, and Physics. Normally a minimum of three graduate-level courses constitutes a minor area.

QUALIFYING EXAMINATION

The Qualifying Examination for doctoral students in the Department is composed of two parts. All incoming doctoral students must pass the first exam-

ination within five semesters of their entrance. This first examination is
Department's Master's Comprehensive Examination (MCE) in the major
The student must demonstrate superior performance to qualify formally as a
dent in the Department at the doctoral level. The requirement to take this
examination is waived for a student who has received an M.S. degree from
department and, within two years prior to entrance, has demonstrated supe
performance on the MCE. A student may take the MCE only two times. F
ure to show superior performance on the MCE in the major field will re
in termination of the student's candidacy.

Upon completion of the student's formal program of study and after d
onstrating superior performance on the MCE and passing the foreign lang
examination, the student is prepared to complete the Qualifying Examinat
The purpose of this second part of the Qualifying Examination is to ascer
that the student's depth and breadth of background and intellectual develo
ment are adequate to support doctoral research and investigation in the
area. After the 1980–81 academic year, the second part of the Qualifying
amination will be given only in the spring semesters.

This second portion of the Qualifying Examination is composed of a
ten part covering the major area (one day) and each minor area (one
each). In addition and subsequent to the written examination, there may be
oral examination. The student must pass the entire second part of the Qu
ifying Examination. A candidate who fails any portion of the Examinat
on the first attempt may take those portions of the Examination one
time if approval is given by the appropriate examining committee. Fa
pass the Qualifying Examination will terminate the student's candidacy
doctoral program.

The questions on the Qualifying Examination are not limited to those
cific areas in which the student has taken course work, but are designe
demonstrate the student's ability to integrate the material from several co
areas as well as from individual study and readings. Hence, the student sh
be familiar with the contemporary work of the current journals and the
tents of the books on the particular reading lists in the areas of examinat
well as those used in the course work.

DISSERTATION

After successfully completing the Qualifying Examination, the student
arrangements for the assignment of a research director (not necessarily
student's faculty advisor), who selects an appropriate advisory committee.
duties of the advisory committee are to be aware of the student's disse
development and, in conjunction with the research director, to give guida
to the student. After the student completes his dissertation, the advisory
mittee will become the examining committee with the addition of at least
new person. The dissertation should be of such quality that all or part
able for publication in the open literature. Doctoral students are encoura
publish their work.

Electrical Engineering Graduate Courses*

201 Natural Modes and Transients in Electrical Systems (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z-transforms; applications. Prerequisite: graduate status. (Fall and spring—evening) (Heller)

202 Linear System Theory I (3)

Graph theory and its application to networks and systems; system description in time and frequency domain; linear spaces and linear operators; mathematical representation of linear systems; analytical and computer solutions of the state equations; transient and steady-state response. Prerequisite: graduate status. (Fall—evening) (Kyriakopoulos)

203 Linear System Theory II (3)

System properties; controlability and observability of linear systems; sensitivity and stability analyses. Irreducible realizations of rational transfer-function matrices; canonical forms, state feedback, and state estimators. Linear composite systems. Prerequisite: EE 202. (Spring—evening) (Kyriakopoulos)

204 Stochastic Signals and Noise (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSci 115 or equivalent. (Fall and spring—day and evening) (Lang)

205 Stochastic Processes in Electrical Engineering (3)

Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth-death process, applications to queuing theory, buffer problems, and the design of communication nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communication theory, control theory, computer science, and propagation theory of random media. Prerequisite: ApSci 115 or equivalent. (Spring—evening) (Lang)

206 Electromagnetic Theory and Applications I (3)

Brief review of vector-phasors and Maxwell's equations, electromagnetic potentials, power and energy; plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchoff approximation; elementary applications. Prerequisite: EE 133 or equivalent. (Fall—evening) (Lang)

207 Electromagnetic Theory and Applications II (3)

Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave-types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky wave an-

*The faculty member whose name appears at the end of each course description is the director for the course. The course director is not necessarily the instructor for any given semester.

tennas, ground wave propagation. Prerequisite: EE 201 or equivalent
206. (Spring—evening) (Lang)

208 Digital Image Processing (3)

Properties of images and visual systems. Picture description, sam
and quantization. One- and two-dimensional image transform techn
including Fourier, Cosine and Hadamard. Methods of image enhan
ment and restoration. Image coding and data compression techniq
Automated image analysis and recognition. Prerequisite: EE
Spring—evening) (Loew)

212 Advanced Network Analysis (3)

Network theorems, network functions, relationship of parts of netw
functions; network properties, realizability and causality concepts; co
puter-aided network analysis. Prerequisite: EE 201, 202; or equival
(Spring, odd years—evening) (Kyriakopoulos)

213 Computer-aided Analysis and Design of Networks (3)

Description and use of network analysis programs such as ECAP
CORNAP, and NASAP. Algorithmic methods for time and frequency
domain analysis of networks using a digital computer, numerical solution
of state equations, fast Fourier transform, network design by optimiza
searches on digital computers, synthesis of electrical networks using uncon
strained optimization techniques in the time domain, network design
through approximation such as Fourier series, Chebyscheff functions, or
Padé approximation. Prerequisite: EE 51, 212. (Fall, odd years
evening) (Kyriakopoulos)

215 Linear Network Synthesis I (3)

Properties and testing of positive real functions. Synthesis of LC, RL, RC
one-port networks. Brune, Bott-Duffin, Miyata, Kuh, and Darlington synt
thesis techniques. Introduction to two-port ladder and lattice synthesis.
Three-terminal RC network synthesis approximation in the frequency and
time domains. Prerequisite: EE 202 or permission of instructor. (Fall,
even years—evening) (Lee)

216 Linear Network Synthesis II (3)

Advanced topics in passive one-port and two-port synthesis. Introduction
to n-port synthesis. Active network synthesis using negative resistance,
controlled sources, NIC, gyrator, operational amplifiers, and circulators.
Synthesis of distributed integrated networks. Computer-aided network
optimization. Prerequisite: EE 215. (Spring, odd years—evening)
(Lee)

221 Physical Electronics I (3)

Theoretical principles underlying the operation of electronic devices; quan
sical mechanics and classical statistical mechanics, the quantum theory
wave and matrix mechanics, quantum statistics. Prerequisite: EE 207 or
equivalent. (Fall—evening) (Braun)

222 Physical Electronics II (3)

The Boltzmann transport equation, band theory of solids, time-dependent
perturbation theory, group theory. Applications to semiconductor and
other solid-state devices such as transistors, tunnel diodes, masers, and
lasers. Prerequisite: EE 221. (Spring—evening) (Braun)

223 Optical Communications Systems (3)

Optical communication channels; survey of laser sources; modulation; line-of-sight links; system models and analysis; detection, photoemitters, photodiodes, and photoconductors; noise mechanisms and signal-to-noise analysis; optical fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optic fiber cabling, repeaters, and systems analysis; integrated optic components. Prerequisite: EE 207, 243. (Spring, even years—evening) (Kahn)

224 Electronics of Lasers (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall, 1981 and every third year thereafter—evening) (Kahn)

225 Nonlinear Electronics (3)

Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators; study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall, even years—evening) (Heller)

226 Fiber and Integrated Optics (3)

Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos-Haenchen shift, Hamiltonian formalism; directional couplers, modulators, and deflectors in fibers and surface films; coupled-mode theory. Prerequisite: EE 223 or equivalent. (Spring, odd years—evening) (Kahn)

227 Industrial Electronics (3)

Applications of electronic devices in industry; continuous and sampled control systems; induction and dielectric heating; timing and counting circuits; reliability and automatic checking equipment; digital control of machine tools. Prerequisite: EE 201 or equivalent; and graduate status. (Spring, odd years—evening) (Heller)

228 High-frequency Electronics (3)

Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communication systems. Prerequisite: EE 207 or equivalent. (Spring—evening) (Heller)

231 Field Analysis and Potential Theory (3)

General study of the theory of potentials as used to facilitate solution of problems in electromagnetic theory, mechanics, thermodynamics, optics, and gravitation. Emphasis on mathematical methods such as Green's functions, variational methods, principal axis transformations, and multidimensional Fourier transforms. Prerequisite: EE 207. (Spring, 1981 and every third year thereafter—evening) (Heller)

232 Electrodynamics (3)

Special theory of relativity and the Lorentz transformation; Minkowski formulation. Maxwell's equations in the context of special relativity, elec-

tromagnetic potentials, and stress tensors. Lagrangian and Hamilton formulations, radiation from moving charges. Introduction to quantu electrodynamics. Prerequisite: EE 207. (Spring, even years—evenin (Braun)

233 Microwaves and Components (3)

High-frequency transmission lines and guided systems; matching tec niques; scattering parameters; transfer parameters; directional couplers cavity resonators; Faraday rotation; ferrite isolators and circulators. Pre requisite: EE 207. (Fall—evening) (Kahn)

234 Electromagnetic Wave Propagation (3)

Retarded time scalar, vector, and Hertz potential. Dipole and dipol array fields; Mie theory of electromagnetic scattering by spheres. Prop agation in electrically and magnetically anisotropic media such as diele tric crystals, space-charge plasmas, and ferrites. Wave propagation i inhomogeneous media; Liouville transformation, Lagrange's variation parameters, WKB solution, invariant imbedding techniques. Propaga tion in stochastic and dispersive media. Prerequisite: EE 207. (Fall even years—evening) (Lang)

235 Antennas (3)

General solution of Maxwell's equations in terms of current sources, po larization, the far field approximations, radiation from current distribu tions, field equivalence theorems, the geometrical optics approximation aperture antennas, receiving antennas, the theory of arrays, and applica tions to specific antennas and antenna types. Prerequisite: EE 3 (Spring, odd years—evening) (Kahn)

236 Plasma Dynamics (3)

Study of the interaction of fluids with electromagnetic fields. Generaliz Navier-Stokes and energy equations, magnetogasdynamic and magneto hydrodynamic approximations, boundary-layer theory, statistical theor of turbulence, generalized Von Karman-Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 30 (Spring, 1980 and every third year thereafter—evening) (Braun)

237 Waves in Random Media (3)

Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and random distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communication channel modeling. Computer simulation by Monte Carlo technique Prerequisite: EE 204, 207. (Fall, 1980 and every third year there —evening) (Lang)

238 Remote Sensing (3)

Description and analysis of active and passive remote sensing system including scattermeters, real aperture imaging and synthetic aperture ra dars. Sensing of surface, subsurface and atmospheric parameters at micro wave, infrared and optical frequencies. Analysis of radiometric techniques using radiative transport theory; inverse scattering methods; profile re version. Prerequisite: EE 207. (Spring, odd years—evening) (Lang

239 Numerical Laboratory in Electromagnetics (3)

Numerical methods for the solution of electromagnetic problems dea with scattering by complex shapes, antenna design, transmission throug

anisotropic and dispersive media, electrodynamic interactions with charged particles. Convergence experiments dealing with moment methods, hybrid GTD, variational computations. Prerequisite: EE 207 and CSci 100. (Fall, even years—evening) (Kahn)

241 **Information Theory** (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204. (Fall—evening) (Helgert)

242 **Coding Theory** (3)

The PCM Communication System, mathematics of coding; groups, rings, and fields; linear codes: parity and generator matrices, syndromes error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation; cyclic codes: implementation and performance; BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. Prerequisite: EE 204. (Spring—evening) (Helgert)

243 **Communication Theory I** (3)

Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—day and evening; spring—evening) (Pickholtz)

244 **Communication Theory II** (3)

Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov-Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring—day and evening) (Pickholtz)

245 **Signal Detection and Estimation Theory** (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent. (Fall—evening) (Pickholtz)

246 **Digital Communications** (3)

Digital transmission for data, voice, and video. Modern practice in data communication; voice digitization, PCM, delta modulation, linear predictive coding. Bounds for digital signaling, pulse dispersion and intersymbol interference. Nyquist criteria, eye openings; adaptive equalizers, decision feedback, partial response techniques. Regenerative repeaters; timing extraction, synchronization and jitter. Transmission codes. Multiplexing and framing. Error control for data. Digital switching and inte-

grated digital networks. Topics from spread spectrum and secure ... munications. Prerequisite: EE 241, 244 or equivalent. (Spring—... ning) (Pickholtz)

247 Communication Systems (3)

Analysis and design of coherent communication systems. Phase-loc... loop dynamics noise behavior and optimization. Parameter estima... theory and Wiener filters with application to optimum demodulation ... analog waveforms (DSB-AM, SSB-AM, FM). Partially coheren... demodulation. Comparative analysis of modulation systems. Frequ... acquisition and synchronization. Selected topics in channel impairm... and multiple access. Prerequisite: EE 241, 244. (Fall—evening ... holtz)

248 Data Communication Systems (3)

Introduction to data networks. Common carriers, specialized carriers, ... ue added networks. Operations, facilities, services, tariffs. Data transm... sion over the telephone network. Channels, carriers systems, hierarchie... Terminals, modems, multiplexors, concentrators, communication proce... sors. Standards and protocols. Coding for error control, data encryption. Data transmission via satellite. Communication software. Survey of do... mestic and foreign data networks. Regulatory and economic issues. (Fall—evening) (Helgert) (Should be taken in sequence with EE 249.)

249 Theory of Data- and Computer-Communication Networks (3)
(Formerly Data Telecommunication Networks)

Design and analysis of computer-communication and terminal oriented networks. Line, message and packet switching. Traffic theory for data. Queuing models. Delay and cost minimization, topological design algorithms. Network routing, polling, and flow control. Analysis and design of protocols for packet switched structures. Prerequisite: EE 204 or ... (Spring—evening) (Pickholtz) (Should be taken in sequence with EE ...

***250 Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards, and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems. (As arranged) (Pickholtz)

***251 Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communication system. Digital transmission and terminals. Wideband data transmission. Frequency allocation. (As arranged) (Pickholtz)

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* EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

252 Digital Signal Processing Techniques (3)

Digital signal processing and data reduction techniques; applications to communications, controls, image enhancement, radar, and speech processing. Least-squares fitting of polynomials; sampling and quantization. Recursive and nonrecursive digital filter design. Generation and shaping of pseudo-random noise. Estimation of correlation functions and spectral densities. Digital processing for Kalman-Bucy filters. Extraction of signals and timing from noise. Fast Fourier and Hadamard transforms. Software and hardware implementation of signal processing algorithms. Prerequisite: EE 51 or equivalent; EE 204; and graduate status. (Fall—evening) (Helgert)

253 Sonar Systems (3)

Underwater sound propagation; transducer and transducer arrays; detection, localization, and tracking techniques; array processing; time compression correlation and digital processing of signals; effects of nonhomogeneous noise fields; applications to navigation and communications in the ocean environment. Prerequisite: EE 204. (Fall—evening) (Helgert)

254 Radar Systems (3)

The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design; ambiguity functions; Doppler radar; phased arrays; synthetic aperture techniques; digital and optical processing and computer control. Applications. Prerequisite: EE 206, 244. (Spring—evening) (Helgert)

255 Optical Processing (3)

Fourier transforms by diffraction of light, optical spectrum analysis, optical memories and systems, holography and holographic techniques, properties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall, even years—evening) (Kahn)

257 Secure Communications (3)

(Formerly Issues in Computer Communications)

Spread-spectrum techniques, time and frequency hopping, direct sequence encoding. Link jamming models and jamming effectiveness. Adaptive null steering arrays, nulling algorithms, effects of intelligent jammers. Data link encryption, data encryption standards and public key cryptosystems. Prerequisite: EE 242, 244. (Fall—evening) (Pickholtz)

258 Radio Communication Systems I (3)

Analysis and design of microwave communication systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of earth curvature and characteristics of over-land and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening) (Lang)

259 Radio Communication Systems II (3)

Morphology of the ionosphere, propagation of ionspherically reflected radiowaves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, non-

Gaussian channel performance, diversity, fading channel error co
typical VLF, LF, and HF system design. Prerequisite: EE 258 or pe
sion of instructor. (Spring—evening) (Lang)

261 **Electromechanical Energy Conversion** (3)

Characteristics of synchronous machines, synchronous reactance, reacta
theories, synchronizing generators and parallel operation of machi
characteristics of asynchronous machines, machines as circuit eleme
steady-state and dynamic performance of alternating current machi
(Fall—evening) (Harrington)

264 **Direct Electrical Energy Conversion** (3)

Theory and practice for direct production of electricity using solar ce
thermionic converters, fuel cells, and batteries. Concepts of solid st
energy bands, work function and conversion efficiency, and limitatio
(Spring—evening) (Heller)

265 **Electrical Power Production** (3)

Integration of energy systems to produce and distribute electric pow
Assessment of systems in terms of power, energy, potential, efficiency
performance, capacity, availability, resource, system constraints, environ
mental impact, material, equipment, construction, capital investment, o
eration costs, energy pricing, benefit for resource and institutional co
straints. Interface of energy and other systems for optimal solutions
Concepts of conversion, cogeneration, grid connection, storage, contro
and demand limiting in utility, community and demand energy systems
Pollution control. Use of fossil fuels, biomass, hydrogen, gasification, hydr
faction, hydro, geothermal, ocean thermal, tidal, wave, wind, magnetoh
drodynamics, fusion, fission, photovoltaic, solar thermal, thermoelectric
tanker, pipeline, high voltage AC & DC, low voltage DC, cables, mech
wave, cryogenics, batteries, engines, motors, and heat pumps. (Fall,
odd years—evening) (Harrington)

266 **Electrical Power Transmission and Distribution** (3)

D.C. and multi-phase high voltage transmission line parameters, voltage
current, impedance and standing waves. Shunt and series passive and
active user loading; current surges, interference, protection and filtering
power factors; substation design and distribution systems. (Spring,
even years—evening) (Heller)

267 **Power Networks** (3)

Symmetrical components, short and opened circuit analysis of power net
works, stability of electrical grids, fault analysis, network reliability, fre
quency control, load flow analysis. Prerequisite: permission of instructor
advisor. (Fall, even years—evening) (Harrington)

269 **Issues in Electrical Power Systems** (3)

Electrical effects of overhead transmission lines, corona effects, radio in
television interference, audible noise emission, electric and magnetic fiel
and ozone emissions. (Spring, odd years—evening) (Harrington

272 **Discrete Systems** (3)

Sampling processes and theorems; Z-transforms and modified Z-transforms
responses of discrete systems using transformation techniques and state
equations; stability criteria; design of digital controller for discrete systems
Prerequisite: EE 202 or equivalent. (Spring, even years—evening)
(Kyriakopoulos)

273 System Optimization (3)

Parameter optimization problems; theory of minima and maxima. Optimization problems for dynamic systems; calculus of variations; the maximum principle and the Hamilton-Jacobi equation. Optimization problems with constraints; optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Fall—evening) (Carroll)

274 Nonlinear Systems (3)

Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov's asymptotical method and Tsypkin's locus. Forced oscillations—jump resonance. Stability analysis—Liapunov's criterion, Luré's problem, and Popov's method. Prerequisite: EE 203. (Spring, odd years—evening) (Carroll)

275 System Identification and Adaptive Systems (3)

Introduction to the adaptive problem and practical applications. Determining the mathematical representation of systems—the identification problem. Optimal estimation of states in the presence of uncertainties. Adaptive systems. Prerequisite: EE 203, 204; or equivalent. (Fall, even years—evening) (Lee)

276 Cybernetics (3)

Principles of machines or mechanisms made by men or nature with regard to their ways and forms of possible behaviors: regular, determinate, or reproducible; fundamental concepts of finite differences; changes and transformations as sets of transitions, leading to stability and feedback; statistical concepts of complex systems and blackbox theory; Shannon's information theory; regulation and control of mechanisms. Prerequisite: EE 204 or equivalent. (Fall, odd years—evening) (Helgert)

277 Satellite Communication Systems (3)

Theoretical and applications aspects of satellite communications. Modulation and multiple access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random access techniques and satellite packet communications. Prerequisite: EE 244. (Fall—evening) (Pickholtz)

278 Spacecraft Systems Design (3)

Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and re-entry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening) (Heller)

280 Introduction to Medicine for Engineers I: Physiology and Anatomy (3)
(Formerly EE 283)

Designed to acquaint the engineering student with the physiology of the human body: material based on the curriculum of the School of Medicine and taught from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs, which are then related to the various systems of the body; interrelationships of the body systems, i.e., the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening) (Eisenberg)

281 Introduction to Medicine for Engineers II: Physiology and Anatomy (3)
(Formerly EE 284)

Further elaboration of physiological systems, such as the endocrine s renal physiology, gastrointestinal physiology, and others; the separa tems of the body are integrated to present the functioning of the bo an overall system; considerable interaction with physicians and other cal personnel. Prerequisite: EE 280 (former EE 283). (Spring— (Eisenberg)

282 Medical Instrumentation I (3)
(Formerly EE 281)

Theory of measurements in biological areas, techniques for elect measurements on biological specimens, current problems in medical trology stressing electronic systems. Prerequisite: EE 280 (former EE or permission of instructor. (Fall—evening) (Eisenberg)

283 Medical Instrumentation II (3)
(Formerly EE 282)

Medical telemetry systems, medical use of the computer, engineering te niques in patient treatment, principles of good medical instrumentat Prerequisite: EE 280 (former EE 283) or permission of instruc (Spring—evening) (Eisenberg)

285 Sensory-evoked Potentials I (3)
(Formerly EE 286)

Physiological significance of the sensory-evoked potential, stimulus variables, subject variables, data acquisition procedures and instrumenta tion, signal-averaging computers, analysis techniques for the VEP, appl cations of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 280 (former EE 283), 281 (former EE 284), 282 (former EE 281), 28 (former EE 282); or permission of instructor. (Fall—evening) (Eisen berg)

287 Engineering in Physical Medicine and Rehabilitation (3)
(Formerly EE 285)

Application of engineering theory and techniques to the rehabilitation of handicapped persons: major problem areas and general approaches, as well as specific solutions. Offered cooperatively with personnel from the Social and Rehabilitation Services Administration. Prerequisite: EE 281 (former EE 284). (Spring, odd years—evening) (Eisenberg)

289 Clinical Engineering (3)

A cross-sectional view of clinical engineering applications, functions, var ations, and patterns in the medical and allied health care area. Use of instrumentation, computers, and systems by clinical engineers in hospitals and clinics. The clinical engineer in cardiovascular measurement systems and intensive care units; other areas where functional usage of clinical engineering is applicable. Prerequisite: EE 280 (former EE 283), 281 (former EE 281), 283 (former EE 282). (Fall, even years—evening) (Eisenberg)

298 Research (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research (3–3)**
(Fall and spring)

319 **Systems Science, Networks, and Controls Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

321 **Approximate Mathematical Techniques for Electromagnetics** (3)
Asymptotic methods for Maxwell's equations, geometric optics, WKB approximation for stratified media, uniform expansion near a caustic and shadow boundary; perturbation techniques for tenuous medium—Rayleigh Gans approximation, smoothing and multivariable methods for stochastic problems. Prerequisite: EE 204, 207. (Spring, 1982 and every third year thereafter) (Lang)

322 **Advanced Waveguide Diffraction and Design** (3)
Selections from the following: Analytical treatment of waveguide bifurcations and discontinuities by Wiener-Hopf, mode matching, static approximation, and other techniques. Small apertures (obstacles) in waveguides. Variational methods for evaluation of equivalent circuit parameters. Group theoretic methods for symmetrical junctions. Prerequisite: EE 233. (Fall, 1982 and every third year thereafter) (Kahn)

323 **Principles of Microelectronics** (3)
Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening) (Helgert)

329 **Electrophysics Research** (arr.)
Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

345 **Advanced Detection Theory** (3)
Review of general estimation equations. Linear estimation; Weiner and Kalman-Bucy filters; nonlinear modulation theory; angle-modulation systems, analysis and design of phase-lock loops, optimum angle-modulation, rate distortion theory; Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening) (Pickholtz)

346 **Communications Switching and Traffic Theory** (3)
Switching network technology, step-by-step common control, stored program electronic switching systems. Traffic models. Engineering of multiple server systems, analysis of graded multiples and multistage connecting networks. Software issues, digital time division and store and forward switches. Analytical bounds on the complexity of switch networks, combined circuit and message switching. Current practice and practical issues. Prerequisite: EE 243 or permission of instructor. (Spring, even years—evening) (Pickholtz)

347 **Data Communications** (3) (Same as CSci 244)
Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexors, concentrators. Line con-

trol procedures. Protocols for buffer management, message reassem queue control. Distributed processing; terminal-oriented systems, data co lection loops, multi-drop lines. Switched data systems; circuit and p switching. Error control, cryptosecurity. Hardware and software int facing. Prerequisite: EE 243 and CSci 201, 202, or permission of i structor. (Spring—evening) (Pickholtz)

349 Communications Research (arr.)
Limited to students preparing for the Doctor of Science qualifying exa nation. May be repeated for credit. (Fall and spring)

371 Simulation Methods for System Analysis (3)
Survey of simulation languages. Techniques of model building for ma rial- and machine-based systems. Treatment of these systems with no of transactions and states. Modeling the dynamic processes of gra problems. Analog, hybrid, and digital methods for simulation treated means of case studies; speed and cost of alternate computing procedure Project-type problems used to illustrate simulation methods. Prerequis CSci 278 or permission of instructor. (Fall, odd years—evening) (Bek

372 Analysis and Control of Large Systems (3)
Systems as multistage decision processes. Analytical concepts of mode making and matrix representations of large systems. Approximation models of lower dimension—reduction to simplified models; decentraliz systems. Differential games; computation of saddle points; construction an equilibrium point. Prerequisite: EE 273. (Spring, even years—eve ning) (Lee)

380 Bioelectric Phenomena (3)
(Formerly EE 381)
Mathematical treatment of selected bioelectric phenomena. Membra thermodynamics; membrane electrical potentials and subthreshold ma brane effects; membrane dynamics. Solid-state phenomena in biology an medicine. Photoconduction. Mechanism of nerve propagation. Electric models of the heart. Cell physiology. Quantum effects in biological sy tems. Prerequisite: EE 206, EE 280 (former EE 283), 282 (former 281), 283 (former EE 282). (Fall, odd years—evening) (Eisenberg)

381 Computer-aided Analysis of Physiological Signals (3)
(Formerly EE 287)
Computer analysis of physiological data obtained from the cardiovascu pulmonary, and nervous systems. Sources and detection of various signa obtained from these systems; preprocessing of real signals; algorithm techniques applicable to the analysis of these signals. Students are pro vided with real data and develop computer software for determinin pertinent medical parameters as established by physicians. Prerequis EE 280 (former EE 283), 281 (former EE 284), 282 (former EE 281), (former EE 282); and a working knowledge of FORTRAN. (Spring odd years—evening) (Loew)

382 Physiological Controls and Systems (3)
(Formerly EE 288)
Some applications of control and systems theory in the medical and bio logical fields. Application of general control and systems theory as a to physiological systems. Specific applications of control and system theory to the visual system, respiratory system, cardiovascular system

and musculoskeletal system. Prerequisite: EE 172 or equivalent; EE 280 (former EE 283), 281 (former EE 284), 282 (former EE 281), 283 (former EE 282). (Spring, even years—evening) (Loew)

385 **Sensory-evoked Potentials II** (3)
(Formerly EE 386)

A continuation of EE 285. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research; emphasis on clinical applications. Planning and conducting an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background from an instrumentation, computer, and data analysis viewpoint. Prerequisite: EE 285 (former EE 286) and permission of instructor. (Fall, odd years—evening) (Eisenberg)

389 **Medical Engineering Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Computer Science Graduate Courses

201 **Introduction to Computer Systems** (3)

Introduction to programming digital computers in assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Techniques of structured programming. Use of a higher-level procedural language. Stacks and recursion. Prerequisite: CSci/EE 51 or CSci 100 or equivalent, and programming experience using assembly language. (Fall and spring—evening) (Bock)

203 **Microprocessors and Microcomputers** (3)

Microcomputer structure and components. Microprocessor architecture, registers, ALU, stacks, information flow, and control. Microprocessor support hardware, RAMS, ROMS, PLA's, counter timers. Hardware and software of typical 8-bit microcomputers. I/O structure in microcomputers; interrupts and DMA operations. 16-bit microprocessors, hardware structure and software capabilities. Bit-slice microprocessors. Prerequisite: CSci 154 or permission of instructor. (Fall—evening) (Abdalla)

208 **Computer Programming** (3)

Use of a macroassembler in structured programming. Input/output programming at the assembly level. I/O buffer pools and their management. Program status and control, interrupt handling, reentrant subroutines. Linkers and loaders. Utilities. Introduction to operating systems and job control languages. Prerequisite: CSci/EE 158 and CSci/EE 157; or CSci 201 or permission of instructor. (Spring—evening) (Maurer)

213 **Discrete Structures in Computing** (3)

Introduction to discrete mathematical structures used in computing. Sets, graphs, functions, mappings, lattices, groups, and semigroups. Combinatorial problems and enumerations. Finite-state machines, representations,

identification, transitions, and reductions. Directed graphs, trees, ... paths through a program. Regular expressions and relations betwe... programs and computing machines. Prerequisite or concurrent regist... CSci 51 or CSci 100 and permission of instructor. (Fall and spri... evening) (Pickholtz)

215 Advanced Data Structures and High-Level Algorithms (3)

Exchange sorting, binary search, sparse matrix transpose and multip... tion. Stack and queue insertion and deletion. List insertion and del... lists of available space. The boundary tag method, the Deutsch-Scho... Waite algorithm, the Knuth-Morris-Pratt algorithm. Inorder, preo... and postorder traversal of trees, alpha-beta pruning, Tarjan's UNION ... FIND. Depth-first and breadth-first search, Kruskal's algorithm, topolog... sorting, shortest paths in a graph. Quicksort, heap sort, radix sort... merge sorting, sorting of files. Binary search trees, including AVL tre... B-trees and tries. Hashing and collision handling. Critical paths a... PERT. Prerequisite: CSci 159. (Spring—evening) (Berkovich)

216 Information Retrieval Systems (3)

Information organization and retrieval of natural language data by digi... computer systems; statistical, syntactic, and logical analysis of natural la... guage used for retrieval systems; dictionary systems including thesau... look-up and phrase structures; searching strategies and cataloguing. Inp... preparation and output structures; large-scale file structures and operati... systems required for their use. Prerequisite: CSci 159 or former 214, 2... CSci 227, or permission of instructor. (Spring—evening) (Foley)

219 Interactive Computer Graphics I (3)

Architecture and implementation of display and interaction devices. Inte... active graphics programming. Functional capabilities of graphics pack... ages. Implementing a graphics package. 2D and 3D viewing, clipping, 3D... transformations. Interaction techniques and human factors. Raster graph... scan-conversion algorithms. Hidden surface and hidden edge removal algo... rithms. Shading and texturing techniques. Prerequisite or concurrent regis... tration: CSci 159 or former 214 or permission of instructor. (Fall—... evening) (Foley)

220 Pattern Recognition (3)

Applications of pattern recognition, vector spaces, estimation and samples... Bayes estimation; density functions; stochastic approximation; decision rules... in pattern recognition, minimal risk, Gaussian filters; bounds of risk, near... est-neighbor decision rules; clustering techniques, feature extraction. Se... quential and nonparametric methods. Pattern recognition with a priori... knowledge. Introduction to syntactic methods. Prerequisite: EE 20... (Fall—evening) (Loew)

222 Design of User-Computer Dialogues (3)

Design of dialogues for interactive terminal systems, including graphics... systems. Psychological, physiological, linguistic, and perceptual factors... Advantages and disadvantages of various interaction techniques, command... language syntaxes, and data presentations. Design methodology and... guidelines. Case studies, research readings, and projects. Prerequisite... CSci 159 or former 214 or permission of instructor. (Spring—evening)... (Foley)

223 **Simulation and Heuristics** (3)

Techniques of deterministic and probabilistic simulation on the digital computer. Mathematics for simulation; design of systems modules; random number generation and testing. Markovian and bounded context systems; generation of stochastic variates; Monte Carlo techniques; heuristics; verification techniques; simulation languages. Prerequisite: CSci/EE 157, 158, or CSci 201, 215, and permission of instructor. (Fall—evening) (Bock)

224 **Artificial Intelligence** (3)

Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene analysis and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill-climbing, network searching, min-max and alpha-beta pruning. Problem-solving systems. Prerequisite: CSci 159 or former 214. (Spring—evening) (Bock)

227 **Management Information Systems and Data Base Management** (3)

Concepts in management information systems. Commercial programming features of COBOL and PL/I. Inverted files and query systems. Editing, report generation, updating, and updating load. Tradeoff between direct access and indexed-sequential access. Maintaining large programming systems which lead to the need for data base management systems; construction of data base management systems. Survey of some existing data base systems. Relational data base concepts and future developments. Students will create and update a data base and interface to application programs. Prerequisite: CSci 208; 159 or former 214. (Fall—evening) (Foley)

229 **Security and Privacy in Computer Systems** (3)

Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, problems of statistical inference. Effects of operating systems and machine architecture on security. Cost trade-offs and risk analysis among various countermeasures. Theoretical models. Related nontechnical measures. Effect on system design of legal constraints on data banks. Current and potential legal constraints. Prerequisite: CSci 159 or former 214 or equivalent. (Fall—evening) (Hoffman)

231 **Sequential Machines** (3)

Finite state sequential machine theory and design, state identification, information losslessness, state minimization in incompletely specified tables partition theory, decomposition of machines, asynchronous machine design, structural simplicity and design with ROM's and PLA's (Planar Logic Arrays). Prerequisite: EE/CSci 153. (Fall—evening) (Friedman)

232 **Automata and Formal Languages** (3)

(Formerly Automata Theory)

Regular expressions including equality and transformations between sequential machines and regular expressions. Turing machines, recursive functions, predicate calculus, and computability. Complexity of algorithms. Formal language theory including grammatical construction, recognizers, relationships between machines and grammers. Nondeterministic automata. Prerequisite: CSci 213. (Spring—evening) (Feldman)

237 **Computing Systems** (3)

Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage

devices; computer control and interrupt structures. Input-output char... and interfacing problems. Communications in digital computers. Int... duction to multiple-access and time-sharing systems. Prerequisite: CSci 1... 154. (Fall—evening) (Abdalla)

239 Comparative Computer Systems (3)

Structures of computers and a general language for system descripti... History of different computer structures. Development of the opera... system. Special purpose processors. Multiprocessors and large ... ing systems. Computer networks and time-shared systems. Compari... of computer families. Characteristics and philosophies of computer d... of the major manufacturers. Introduction to performance evaluation a... measurement. Effects of software and technology on computer structure... Prerequisite: CSci 237, 263. (Spring—evening) (Meltzer)

240 Theory and Practice of Microprogramming (3)

Basic concepts, techniques, and theory of microprogramming as appli... to the implementation of control systems for sequential machines. Micr... programming languages, assemblers, and hardware simulators, includi... specific applications of these to the design of current computer syste... and their interfaces with real-time systems. Prerequisite: CSci 157, ... (Spring—evening) (Merwin)

243 Fault Tolerant Systems and Design Automation (3)

Fault test generation for combination and sequential circuits, digi... simulation as a diagnostic tool, design of easily tested and fault tolera... systems. Physical packaging of digital circuits; design of circuit boar... including partitioning, placement, and interconnection of elements. Pr... requisite: CSci/EE 153. (Fall—evening) (Friedman)

244 Data Communications (3) (Same as EE 347)

Principles and practice of modern data communications. Modes for da... transmission; terminals, modems, multiplexors, concentrators. Line co... trol procedures. Protocols for buffer management, message reassem... queue control. Distributed processing; terminal-oriented systems, da... collection loops, multi-drop lines. Switched data systems; circuit an... packet switching. Error control, cryptosecurity. Hardware and softw... interfacing. Prerequisite: EE 243; CSci 201 or permission of instruc... (Spring—evening) (Meltzer)

245 Advanced Computer Systems Theory I (3)

Analytical models applied to computing systems. Determinance, dea... locks, concurrency, and synchronization of computer processes. Optim... task scheduling using linear graph theory. Concurrent processes in mul... processors. Analysis of the overlap of I/O and CPU processing. Queui... theory applied to time-shared computer models. Analysis of seconda... storage devices and effective data rate. Analysis of memory buffer pol... and multiprogrammed memory allocation. Memory allocation and ... age heirarchy operation and their effect on throughput and respons... time. Prerequisite: EE 204; CSci 237, 263. (Fall—evening) (Abdalla)

246 Advanced Computer Systems Theory II (3)

Optimum secondary storage placement algorithms to improve throughp... Modeling of secondary storage operation and data staging. Analysis ... memory allocation algorithms to improve system performance. Chara... teristics of computer system hardware and software to provide for mu... processing, multiprogramming, and time-shared operation. Loosely ...

tightly-coupled multiprocessors. Analysis of front-end processors in data base operation and computer networks. System analysis of a large, time-shared, terminal-oriented transaction processing system. Prerequisite: CSci 245. (Spring—evening) (Abdalla)

255 **Analysis and Correctness of Algorithms** (3)

(Formerly Formal Languages, Correctness and Structured Programming)

Basic tools of analysis of algorithms. Space and time measures, O(n) and O(f(n)), computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 159 or former 214. (Fall—evening) (Maurer)

256 **Design of Translators** (3)

Design of procedure-oriented computer languages. Semantics and pragmatics as they affect the design of translators, interpreters, and compilers. Top-down and bottom-up recognizers. Production of machine code. Syntax-directed compiling. Tables and their organizations in translators. Optimizing compilers; compiler-compilers. Prerequisite: CSci 159 or former 214. (Spring—evening) (Maurer)

258 **Advanced Programming Languages** (3)

Recent developments in programming language research. Modern data-structuring concepts such as abstract data structures, access control for reliability, and structuring of data in special-purpose languages. Language extensibility. Machine-independent design of language processors. Case studies will include Snobol 4, Pascal, and advanced concepts in PL/I. Students' projects will emphasize applications of these languages and concepts. Prerequisite: CSci 159 or former 214 and permission of instructor. (Spring—evening) (Feldman)

263 **Digital Computer Programming Systems** (3)

Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control including linking, loading, linkage-edit, relocatability, region size, and status switching. Design of dispatchers and monitors. Design of utility programs. Input-output programming and control. Communications among components of the operating system. Prerequisite: CSci 208; 159 or former 214. (Fall—evening) (Maurer)

267 **Operating Systems I** (3)

Introduction to the operating system for batch-oriented multiprogrammed computer systems. Software components which constitute the operating system. Facilities of the macro-assembler which utilize the operating system; loading and linking routines; initializing programs and tasks; dispatching and the interrupt mechanisms. Memory management in fixed and variable partitions; device and storage management. Input-output control and use of access methods. Performance evaluation. Prerequisite: CSci 263. (Fall—evening) (Hoffman)

268 **Operating Systems II** (3)

Introduction to operating systems for time-shared and multiprocessor computer systems. Processor management in a multiprocessor system;

deadlocks, processor utilization, and I/O management. System reliability and fail-soft mechanisms. Time-slicing and time-sharing operating systems and subsystems; transaction processing subsystems; memory management in a paged and segmented virtual memory system. Performance of the operating system. Computer network software and an introduction to the computer as a utility. Introduction to security and large data base management. Prerequisite: CSci 267. (Spring—evening) (Hoffman)

278 Analog and Hybrid Computers (3)

Analog computer components and electronics. Slow analog computer solutions of linear and nonlinear differential equations. System simulation and modeling on the analog computer. Introduction to the iterative analog computer. Transfer function simulation and use in control theory. The hybrid computer, digital logic, and digital computer control. Digital-to-analog and analog-to-digital converters and interfaces. Optimization methods on a hybrid computer. Parameter variations and search methods. Prerequisite or concurrent registration: CSci/EE 154, or permission of instructor. (Fall—evening) (Bock)

281 Applications of Numerical Methods I (3)

Basic numerical methods with emphasis on their application to engineering problems. Error sources and error control; numerical representation of functions; over-determined systems; eigenvalues and eigenvectors; introduction to nonlinear equations; initial value and boundary value problems for ordinary differential equations. Theoretical concepts such as order of accuracy, Richardson's extrapolation, norm, stability, and convergence. Some modern methods such as spline approximation and the QR algorithm for eigenvalues. Prerequisite: CSci 201 or equivalent. (Fall—evening) (Meltzer)

282 Applications of Numerical Methods II (3)

A continuation of CSci 281. Systems of nonlinear equations; numerical optimization; numerical solution of common partial differential equations of engineering; methods for hyperbolic, parabolic, and elliptic problems; introduction to finite element methods. Prerequisite: CSci 281. (Spring—evening) (Meltzer)

285 Approximation of Functions and Data Representations (3)

Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening at NASA Langley Research Center; spring, even years—evening, on campus) (Meltzer)

286 Numerical Methods in Engineering I (3)

Computational methods for solution of systems of linear algebraic equations and for the solution of the algebraic eigenvalue problem. Emphasis on accuracy and efficiency. Methods for banded and other sparse systems. Methods for parallel and pipeline processer computers. Prerequisite: CSci 281 and knowledge of linear algebra. (Spring—evening) (Meltzer)

287 Numerical Methods in Engineering II (3)

Computational methods for solution of systems of ordinary differential equations: single-step methods, general multistep methods; convergence and stability analysis, methods for stiff equations, step size control and

control of order. Prerequisite: CSci 281 and knowledge of differential equations. (Spring—evening) (Meltzer)

288 **Numerical Methods in Engineering III** (3)

Computational methods for solution of boundary value problems in both ordinary and partial differential equations: shooting methods, finite difference methods, functional approximation methods, invariant imbedding, method of lines, treatment of boundaries in multidimensional problems. Prerequisite: CSci 282 and knowledge of differential equations. (Fall —evening) (Meltzer)

289 **Numerical Methods in Engineering IV** (3)

Computational methods for solution of initial value problems for partial differential equations: method of lines, consistency, stability, convergence; explicit and implicit finite difference methods, alternating direction methods, high-order methods. Prerequisite: CSci 282 and knowledge of partial differential equations. (Fall—evening) (Meltzer)

298 **Research** (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299-300 **Thesis Research** (3-3)

(Fall and spring)

319 **Interactive Computer Graphics II** (3)

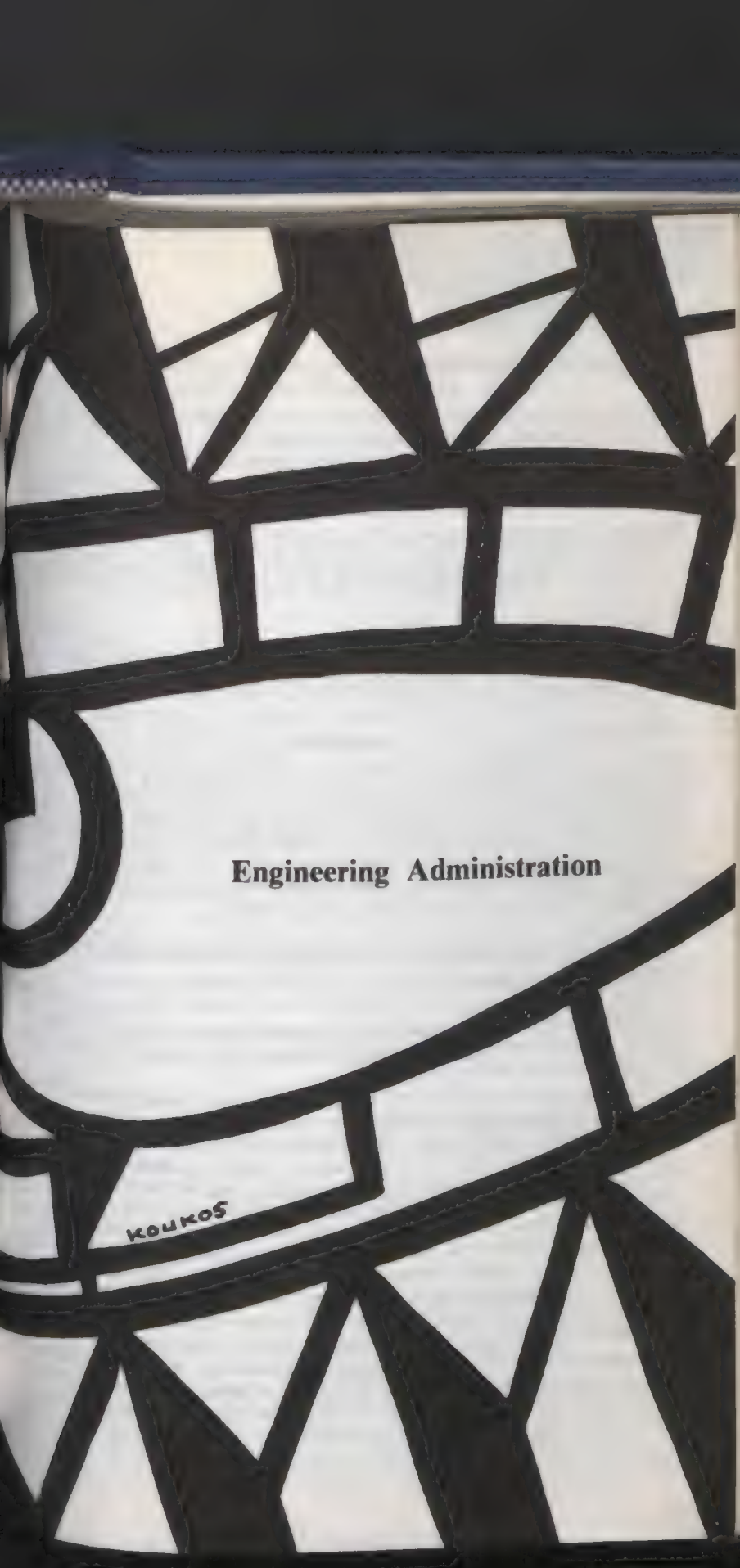
Hidden surface algorithms, mathematics and data structures for surface representation, surface texture models, color models, animation, simulation, graphics programming languages, architecture of high-performance hardware, homogeneous coordinates. Prerequisite: CSci 219. (Spring, even years—evening) (Foley)

391 **Computer Science Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)



Engineering Administration

Engineering Administration

Professors P.A. Crafton, P.S. Shane, J. Kaye, M. Apstein *(Research)*, S. Rot-man *(Chairman)*, H.M. Steiner, S.B. Levin *(Research)*, J.V.R. Kaufma *(Research)*, R.C. Waters, J.H. Schulman *(Research)*, H.B. Sewell

Professorial Lecturers G.M. Coburn, J. Pachter, J.B. Du Peza, C.W. Fotts, D. Hearth, R.A. Hemmes, G.T. Malley, J.A. Belding, D.R. Levin

Associate Professorial Lecturers R.L. Paullin, A. Hoshovsky, L.H. Bla E.W. Ivy, R.F. Sears, G.M. Hollander, P. Rosenberg, J. Lisnyk, W. Goetz, C.A. Kottman, J.R. Margulies, M.H. Novinsky, A.L. Smookler, R. Lynch, Jr.

Assistant Professor B. Silverman

Assistant Professorial Lecturers K. Lamar, T.L. Griswold, S.F. Pauls, F.E. Field, H.K-W. Hung, H.S. Kimmel, R. Gurley, F.W. Shepherd, R.B. Re olds, T.P. Henry, J.L. Pokorney

Graduate Fields and Areas of Concentration

Programs in Engineering Administration lead to the Master of Engineering Ad ministration, Professional, and Doctor of Science degrees. Included are pro grams in Administration of Research and Development, Construction Manage ment, Environmental Management, Information Systems Management, Marke ing of Technology, Technology and Public Affairs, and Transportation Man agement. Programs in Systems Analysis and Management lead to the Master of Science, Professional, and Doctor of Science degrees.

MASTER OF ENGINEERING ADMINISTRATION DEGREE PROGRAM

The principal objective of the program leading to the degree of Master Engineering Administration is to prepare students whose undergraduate educa tion was in engineering, natural science, or mathematics for positions of man agerial responsibility in technological and scientific organizations in industry government, or the armed services.

The program is designed to help the student achieve a broad understanding the administrative process. Although years of experience are required to develop the skills, insight, and mature judgment which distinguish an effective manager in technological and scientific organizations, a graduate professional manage ment curriculum can give the student an effective start as a manager. The cur riculum provides an opportunity to gain an understanding and to develop use ful managerial skills in the functional areas of engineering administration. One of the major purposes is to assist the student in forming the habit of examining problems from an overall administrative point of view. The individual's own particular experience, and the explicit process of relating this experience to graduate study, provide each student with a personal frame of reference to interpret management in a rapidly changing world.

Successful education for engineering administration implies an understand ing of what it is that an engineering manager must do, an analysis of the broad functions involved in management, and a detailing of modern methods useful in making and executing decisions in the management of technological

nd scientific organizations. It is the aim of the Department, therefore, to keep
ive a spirit of general inquiry and a decision-making orientation.

The management of technological organizations is one of the most difficult
hallenges of our times. The professional engineering manager today must un-
erstand not only currently developing technologies but also the rapidly chang-
g marketplace where these technologies are applied for society's benefit. The
ngineering administrator is the link between these dynamic technologies and the
eeds of society in general.

In summary, the program of study has for its objective an educational ex-
erience which will contribute to the development of managers possessing a
ombination of technical know-how and administrative skill.

dmission

addition to the requirements for admission to graduate study (see page
. applicants for programs leading to the degree of Master of Engineering Ad-
nistration must meet the following requirements: (1) The applicant must
e an adequate knowledge of the principles of human relations, the fun-
mentals of engineering economic analysis, and the fundamentals of quan-
ative methods. This requirement can be met by satisfactory completion of
d 150, 160, and 170, or approved equivalents. (2) The applicant may be
uired to complete other undergraduate prerequisite courses prescribed as a
dition of admission. (3) A student is required to earn the grade of *C* or bet-
unless the requirement is stipulated to be a grade of *B* or better upon ad-
sion) in each undergraduate prerequisite course. If this scholarship require-
nt is not met, the student is barred from further enrollment. Credit for
requisite courses is not applicable toward the degree of Master of Engineer-
Administration and, unless approved by the Department Chairman, all pre-
uisite courses must be completed prior to taking graduate courses in this de-
e program.

A student must be accepted in a graduate program in order to receive credit
any graduate courses taken to satisfy degree requirements.

e Courses

following courses are required for the Master of Engineering Administra-
degree and must be taken prior to any other course in the program:
211–12 Engineering Administration (3–3)
269 Elements of Decision-Making and Problem-Solving (3)

eral Program

INEERING ADMINISTRATION

y in engineering administration provides the conceptual depth in manage-
practice and knowledge needed by technical and scientific personnel who
onfronted with increasing demands and complexities. Technical knowledge
mplemented by an understanding of theory and practice in management
n. Engineering management is a logical development of a technological
ty. The program is designed to provide engineers with a knowledge and
ciency in the administration of engineering and science. It emphasizes use
liberative, purposive study of general administrative problems and oppor-
ies as well as the study and use of specific knowledge and methods needed

to solve administrative problems and to explore opportunities. A progr
prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering
ministration (3) (non-thesis)
Electives (15–21). Electives are chosen from the Department of Engine
Administration and other departments of the University, but no more
two courses may be chosen from other departments.

Areas of Concentration

Students wishing to pursue a specific area of concentration, as opposed to
lowing the general program in EAd, may select one of the following progra

ADMINISTRATION OF RESEARCH AND DEVELOPMENT

The program is designed to prepare students for responsible managerial
tions in organizations conducting technological or scientific research and
velopment and in organizations planning and administering programs of
nological or scientific research and development. A program is prescribed
each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 207 The Personnel Function for Engineering Administrators (3)
EAd 255 Administration of Research and Development (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineer
Administration (3) (non-thesis)
Electives (9–15)

CONSTRUCTION MANAGEMENT

Construction management encompasses managerial functions in an organ
tion that plans and executes major construction work. This can take place in
field, in the project office, or in a main office. Due to the inherent complexi
present-day engineering, engineers need to know management as well as
planning, design, and construction methods. They need to know constru
developments, problems of contracts and specifications, techniques of schedu
and control, estimating, labor relations, and industrial or manageme
psychology.

This program prepares the engineer for the task of marshalling men, ma
rials, machines, and money as functions of time, cost, weather, and hu
nature to plan and build structures. A program is prescribed for each stud
in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 241 Construction Management I (3)

EAd 242 Construction Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–12)

ENVIRONMENTAL MANAGEMENT

This program prepares students for positions in organizations involved with environmental and related resource management. This includes organizations conducting environmental control and in organizations planning and administering programs in the prevention and control of environmental pollution and resource utilization. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 221–22 Environmental Management (6)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–12)

INFORMATION SYSTEMS MANAGEMENT

Managers of technological and scientific organizations encounter a variety of management information systems required for day-to-day operations and long-range decisions. This program helps to provide managers with the competence to use such systems effectively. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 251 Management of Computer Organizations (3)
EAd 254 Automatic Data Processing Systems (3)
EAd 295 Management of Technical Information (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
EAd 321 Management Information Systems (3)
Electives (3–9)

MARKETING OF TECHNOLOGY

As the American economy matures and Americans survey the spectrum of options available to them, it is apparent that scientific and engineering outputs must be sold in world-wide competition both at home and abroad. The trained specialist is becoming more important than ever before in performing the selling function.

The objective of this program is to prepare students for responsible positions in marketing technical products and services. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 293 Technical Enterprises (3)
EAd 294 Marketing of Technology I (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
EAd 311 Marketing of Technology II (3)
Electives (6–12)

TECHNOLOGY AND PUBLIC AFFAIRS

This program prepares students for responsible positions requiring management decision-making on matters that involve the impact of technology on public policy and that concern the general interrelationship between modern technology and public affairs. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
EAd 386 Advanced Topics in Management (3)
Electives (9–15)

TRANSPORTATION MANAGEMENT

This program prepares students for responsible positions in the management of transportation systems or in the formulation of transportation policy. A program is prescribed for each student in conference with the adviser.

Required Courses

EAd core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 265 Transportation Management I (3)
EAd 266 Transportation Management II (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
Electives (6–12)

MASTER OF SCIENCE DEGREE PROGRAM

Systems Analysis and Management

The Master of Science degree is offered for students specializing in Systems Analysis and Management. The program is administered by the Department of Engineering Administration.

The student should achieve a broad understanding of the administrative and decision-making processes and of the systems approach to managerial problem-solving, and be competent in applying mathematical and statistical techniques to the solution of managerial problems.

The graduate should be able to develop insight into the variety and nature of managerial problems, their causes, and possible cures. In addition, the graduate should understand the importance of the human factor in administration and be able to apply scientifically-based analysis and quantitative methods in dealing with managerial problems. The systems viewpoint will help in learning to arrange and relate information about the organizational unit in which a problem exists. Whether the student aspires to be a manager or to be a staff person dealing with managerial matters, the student should acquire concepts and experiences helpful in preparing for such a position.

ADMISSION AND PREREQUISITES

Admission requirements for the Master of Science degree in Systems Analysis and Management include a bachelor's degree in engineering, natural sciences, or mathematics from a recognized institution. Applicants to graduate study must, in addition, meet the following requirements: (1) The applicant must have adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses* or approved equivalents: EAd 150, 160, 170, and CSci 51. (2) The applicant may be required to complete other undergraduate prerequisites courses prescribed as a condition of admission. (3) The student is required to earn the grade of *C* or better (unless upon admission the requirement is stipulated to be a grade of *B* or better) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Science in Systems Analysis and Management and, unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

REQUIRED COURSES

EAd 211–12 Engineering Administration (3–3)
EAd 269 Elements of Decision-Making and Problem-Solving (3)
EAd 281 Systems Analysis and Management I (3)
EAd 282 Systems Analysis and Management II (3)
EAd 283 Systems Engineering (3)
EAd 202 Linear System Theory I (3)

Thesis Option—EAd 299–300 Thesis Research (3–3), plus one of the courses listed below (except EAd 297).

*Students may not receive graduate credit for these courses.

Non-thesis Option—(all students must take EAd 297 plus any three of the following courses)

EAd 287 Systems Modeling and Simulation (3)
EAd 297 Problems in Engineering Administration (3)
EE 203 Linear Systems Theory II (3)
OR 201 Survey of Operations Research Methods I (3)
OR 202 Survey of Operations Research Methods II (3)
OR 273 Digital Systems Simulation (3)

PROFESSIONAL DEGREE PROGRAM

The Department of Engineering Administration has established the Professional degree program for those students who are interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or to the degree of Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in engineering administration.

In the Professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Based on departmental requirements, each student's program is planned considering background and needs.

AREAS OF SPECIALIZATION

The Professional degree program provides post-Master's degree graduate study in areas in which the Department has adequate facilities and resources. Upon departmental approval, the student may select courses in other University departments to meet specific needs or objectives. Courses can, upon departmental approval, be chosen in the following areas:

Administration of Research and Development
Construction Management
Engineering Administration
Environmental Management
Information Systems Management
Marketing of Technology
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

A student's program of study will provide concentration in a selected area and include courses from other areas. A program consists of a minimum of 30 semester credit hours of approved graduate courses beyond a Master's degree, six of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of credit hours.

ADMISSION

Admission to graduate study toward the Professional degree requires appropriate bachelor's and Master's degrees from recognized institutions, and an

idence of capacity for productive study. To study toward the Professional degree of Engineer (in Engineering Administration), an applicant must possess a bachelor's degree in engineering; for the Professional degree of Applied Scientist (in Engineering Administration), an applicant must possess a bachelor's degree in mathematics or a natural science. In both cases a Master's degree in engineering administration or a related field is required. Applicants having equivalent backgrounds of study may be considered. At least a 3.00 B average in graduate study is required.

Those applicants having Master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) with a grade of *B* or better.

Those applicants wishing to pursue study in Systems Analysis and Management must possess a Master's degree in systems analysis or a related field. Applicants having Master's degrees in engineering, natural science, or mathematics may be required to complete EAd 211–12, 269, 281, and/or 282 with a grade of *B* or better.

OMISSION TO CANDIDACY

n applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. No courses taken by the pplicant to meet these prerequisite requirements and conditions can be applied ward the Professional degree. If course work beyond the prerequisites and nditions is taken in the interval between admission to study and admission to gree candidacy, a maximum of only 9 hours of this additional course work n, with the approval of the adviser, be applied toward meeting degree quirements.

ANSFER CREDIT

to 6 semester credit hours of satisfactory study (with grades of *A* or *B*) a graduate program beyond a Master's degree will be considered for transfer ward the Professional degree. Previously earned credits must have been ned within 5 years of admission to candidacy for the Professional degree, d must be appropriate to satisfy requirements for the Professional degree. e student must, with the approval of the adviser, petition the Department airman for such transfer.

OGRAM OF STUDY

on admission, the student is assigned a faculty adviser. A program of study drawn up considering any deficiencies at admission, preparation for the Comhensive Examination, and Professional degree requirements. The program study for each student must be approved by the student's adviser and the partment Chairman. An area of concentration is selected to prepare the stut to undertake the professional project. Other courses are selected either support work on the planned projects or to meet other needs. With prior proval of the adviser, up to 9 credit hours of study may be taken in other partments of instruction in the University if such work is pertinent to the gram. These nine hours include the 6 potential transfer credits.

PROFESSIONAL PROJECT

Each degree candidate must engage in a professional project on which the candidate will submit an acceptable report of an analysis and solution of a "real world" problem in engineering administration. The project requires the student to demonstrate the ability to apply newly acquired knowledge to identify a problem, to determine a significant problem, to work toward a solution, and to communicate the results in writing.

When the course work is essentially completed, and with the adviser's approval, the candidate will register for EAd 395–96 *Seminar: Professional Project* (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study, and prepared a study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the project adviser and to the Department Chairman for approval. Six semester credit hours are assigned for work on the professional project.

SCHOLARSHIP

No student studying for the Professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality point average of at least 3.00 *(B)* to receive the degree.

TIME LIMITS

A full-time student in the Professional degree program is allowed a maximum of 3 calendar years from the date of the student's first registration as a graduate student in prerequisite or graduate courses to complete all degree requirements. A part-time student in this program is allowed a maximum of 6 calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

OCTOR OF SCIENCE DEGREE PROGRAM

rograms in Engineering Administration and in Systems Analysis and Manage-ent leading to the degree of Doctor of Science provide advanced study and esearch to enable gifted students to extend their knowledge and to enhance eir career opportunities in research or education.

dmission

ll applicants must meet the general requirements for admission to doctoral udy stated on page 34.

Applicants for doctoral study in Engineering Administration must have a aster's degree, with a superior record of academic achievement in engineer- g administration or a related field. Those applicants having Master's degrees engineering, natural science, or mathematics may be llowing prerequisites: at least the three core courses (EAd 211–12, 269) th a grade of *B* or better.

Those applicants wishing to pursue Systems Analysis and Management must ssess a Master's degree in systems analysis or a related field. Applicants ving Master's degrees in engineering, natural science, or mathematics may be quired to meet the following prerequisites: EAd 211–12, 269, 281, and/or with a grade of *B* or better.

An applicant is admitted to candidacy for the degree after satisfactorily meet- any prerequisite requirements and conditions and after completing *all* rse and language requirements, and qualifying examinations (see p. 34–38). courses taken by the student to meet prerequisite requirements and condi- s can be applied toward the Doctoral degree. If course work beyond the requisites and conditions is taken in the interval between admission to study admission to the degree program, a maximum of only nine hours of this itional course work can, with the approval of the adviser, be applied ard meeting degree requirements.

nsfer Credit

to 6 semester credit hours of satisfactory study, with grades of *A* or *B*, graduate degree program beyond a Master's degree will be considered for sfer toward the Doctoral degree. They must have been earned within the ars preceding admission for the Doctoral degree, and must be appro- le to satisfy requirements for the Doctoral degree. The student must, with pproval of the adviser, petition the Department Chairman for such trans-

rams of Study

r fields leading to the degree of Doctor of Science are available in Engi- ng Administration and in Systems Analysis and Management. In addition e major field, one or two minor areas of concentration are normally re- d, which may be chosen from the areas administered by this Department or from appropriate areas available in other departments of the Univer- The general requirements for doctoral study are stated on pages 34–38. on admission, the student is assigned a faculty adviser. A program of is drawn up considering any deficiencies at admission, preparation for

the Qualifying Examination, and Doctoral degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on page 37. Once the Qualifying Examinations are satisfactorily completed, the candidate identifies an area or problem to study and prepares a research proposal which includes consideration of the feasibility of the proposed research. The detailed project proposal is submitted for approval to the Department Chairman and a selected faculty member who will serve as the student's Director of Research. Work on the research project is conducted as part of the dissertation course EAd 399. The candidate must maintain registration in EAd 399 while the research is conducted.

Scholarship

No student studying for the Doctoral degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a cumulative quality point average of at least 3.2 to receive the degree.

Time Limits

A full-time student in the Doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing (see page 38).

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done while in residence on campus except when special permission is granted by the Department Chairman. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Doctoral degree program under whatever conditions and regulations are in effect at that time.

ENGINEERING ADMINISTRATION UNDERGRADUATE COURSES

150 **Introduction to Engineering Administration** (3)

The interrelationships of engineering, science, and management; concepts, foundations for interaction of human factors in individuals, groups, and

the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12. (Fall, spring, summer)

160 **Introduction to Engineering Economic Analysis** (3)

Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. (Fall, spring, summer)

170 **Basic Quantitative Methods for Engineering Administration** (3)

An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability statistics, and operations research. (Fall, spring, summer)

GINEERING ADMINISTRATION GRADUATE COURSES

204 **Administration of Engineering Contracts** (3)

Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and spring)

207 **The Personnel Function for Engineering Administrators** (3)

Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment. (Fall and spring)

210 **Engineering Law** (3)

Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts. (Fall and spring)

-12 **Engineering Administration** (3–3)

Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, 160, or equivalent. (Fall, spring, summer)

214 **Patent Law** (3)

A comprehensive and systematic introduction to the law of patents, trade secrets, trademarks, and copyright, including the preparation and prosecu-

tion of patent applications. Management decisions involving intellec property rights. The role of the research administrator in preserving perfecting legal rights in innovations. (Spring)

215 **Ethical Issues in Engineering Administration** (3)

Moral philosophy from which ethical considerations are derived issues and exemplary problems encountered in the administration neering and allied areas of human endeavor. Use of case study to enhance student's ability to recognize ethical aspects of problem ations and to think analytically and synthetically about such aspe (Spring)

221–22 **Environmental Management** (3–3)

The spectrum of technical, economic, political, administrative, and soc forces influencing the quality of our environment and the utilization of resources. Review of governmental and industrial programs to combat p lution of the air, land, and water. Historical development of legislati dealing with environmental science and resource management. Review pending legislation involving environmental and energy matters; theoret cal aspects of specific management problems; review of tools for deci making. (Academic year)

231 **Program Management** (3)

Programs and projects are widely used in industry and government to cilitate the management of technical undertakings. Management scienc the systems approach, and traditional managerial concepts are applie a variety of typical cases. (Spring)

241 **Construction Management I** (3)

Contract negotiations; aspects of contracts and specifications importan management. Construction estimating and cost allocation in heavy building construction; budgeting and accounting concepts. (Fall)

242 **Construction Management II** (3)

Construction administration: organization, construction planning, scheduling. Industrial relations and human factors in construction man agement, work measurement, programming and progressing, project man agement and control. (Spring)

243 **Construction Management III** (3)

Managerial problems associated with construction; optimal contractor cision-making; modeling and systems approach to construction manag ment; the search for projects; selection of projects; bidding strate (Fall)

251 **Management of Computer Organizations** (3)

Planning, organizing, and control of computer operations. Management a computer organization as an independent service bureau or as an integra part of a larger organization. Supervision of professional and subprofes sional computer personnel. Prerequisite: EAd 254. (Fall)

253 **Production Management** (3)

Planning, organizing, and control of production; forecasting techniq material management; methods of loading and scheduling production proc esses; electronic methods in production control. Organization and admin

istration of the plant engineering function with emphasis on maintenance control programs. (Spring)

254 **Automatic Data Processing Systems** (3)

Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision-making, business, and society. (Spring)

255 **Administration of Research and Development** (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives. (Fall and spring)

261 **Economic Analysis in Engineering Planning** (3)

Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy, and permission of instructor. (Fall and spring)

262 **Finance for Engineers** (3)

Exposition of the financial concepts encountered in engineering situations; financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation. (Fall)

265 **Transportation Management I** (3)

Integration of social, technical, economic, and political considerations which shape transportation systems and their management. Course material focuses on industry and local, state, and federal government programs in transportation. A management study of a local, regional, or national system will be required. (Fall)

266 **Transportation Management II** (3)

Legal aspects of transportation systems and their management. (Spring)

269 **Elements of Decision-Making and Problem-Solving** (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Model building, testing, solving. Replacement under certainty or risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations. (Fall, spring, summer)

281 **Systems Analysis and Management I** (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. (Fall)

282 **Systems Analysis and Management II** (3)

Extension and elaboration of systems analysis techniques, including their application to industry, input-output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281. (Spring)

283 Systems Engineering (3)

Concept of system structure and organization. Linear and nonlinear s
tems analysis; dynamics and stability of systems. Introduction to op
mization methods and systems simulation techniques. (Fall, odd ye

285 Seminar: Administrative Problems (3)

Individual analysis of complex administrative problems, with group cri
ation and discussion. Prerequisite: 18 semester hours of graduate wo
(Fall and spring)

287 Systems Modeling and Simulation (3)

Introduction to systems modeling and simulation dealing primarily wi
industrial, organizational, and control models. Emphasis on analysis
the system performance and designing an improved system using anal
cal or simulation techniques. Prerequisite: EAd 281, 283 or equivalen
and permission of instructor. (Fall, even years)

288 Technology Issue Analysis—The Engineering Approach (3)

A seminar for technical managers who need the contextual background an
intellectual basis for addressing technology issues in the public and privat
sectors. Technology impact analysis, technology forecasting, and the ass
ciples and practices of technology transfer are treated as elements
systematic approach to informed choice and sound technology decision
(Fall, odd years)

291 Structured Analysis of Management Problems (3)

Application of each phase of a structured problem-solving approach
small-scale management problems. Students will determine problem
symptoms; define problems; select a problem; determine constraints
solutions and alternative feasible solutions; develop the solutions, s
one, test the solution, plan controls on it, and plan its implementa
Prerequisite: EAd 269. (Spring, even years)

293 Technical Enterprises (3)

Essential features of technology-based companies from the entrepreneu
point of view. Team management of an enterprise in a computer-simu
lated environment. For those within technical firms and those within gov
ernment who depend on technical firms as suppliers. (Fall)

294 Marketing of Technology I (3)

Marketing industrial goods and high-technology projects: special attenti
to the federal government as a market. Products, channels, pricing p
motion, and personal selling as elements of strategy. (Spring)

295 Management of Technical Information (3)

Needs and objectives of technical information systems, functions involve
in technical information, storage and retrieval, abstracting, compu
usage in technical information systems, system organization. Prerequ
EAd 251 or permission of instructor. (Spring)

297 Problems in Engineering Administration (3)

Project course providing the student with the opportunity to apply the
various concepts and tools previously studied to the solution of a prob
lem in engineering administration. Students work individually or in sm
groups, each on a problem proposed by the student and approved by the

instructor. Open to Master's degree candidates in the department. (Fall, spring, summer)

298 Research (arr.)

Basic or applied research in engineering administration or systems analysis. May be repeated for credit. Open to Master's degree candidates in the department. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

311 Marketing of Technology II (3)

Continuation of EAd 294. Special attention to marketing research, negotiation, and international marketing. Required for Master's degree candidates in the Marketing of Technology program. Prerequisite: EAd 294. (Fall, even years)

321 Management Information Systems (3)

Study of the development and management of information systems used by middle and higher management of technological and scientific organizations, in the control of many facets of the organization at all managerial levels. Required for Master's degree candidates in the Information Systems Management program. Prerequisite: EAd 295 or permission of instructor. (Fall, even years)

386 Advanced Topics in Management (3)

Reading and discussion of classic and important recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 Technological Forecasting (3)

Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

388 Cost Effectiveness (3)

Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost effectiveness studies, systems approach to cost effectiveness studies. (Spring, even years)

394 Advanced Study (arr.)

Limited to Departmental Professional degree students. May be repeated for credit. (As arranged)

395–96 Seminar: Professional Project (3–3)

Limited to Professional degree candidates in the Department. (Fall and spring)

398 Advanced Reading and Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)




Operations
Research

Operations Research

Professors W.H. Marlow, D. Gross *(Chairman)*, N.D. Singpurwalla, A.V. Fia
co, G.P. McCormick, J.E. Falk, R.M. Soland
Adjunct Professor F. Frishman
Professorial Lecturers C. Anello, I-C. Hsu, W.R. Nunn, B. Schwartz, H. Wei
garten, S.C. Tignor, D.B. Webster
Associate Professor D.R. Miller
Associate Professorial Lecturers J.W. Blankenship, D.R. Edmonds, P.L. Hay
J.L. Horowitz, G.R. McNichols, L.J. Riccio
Assistant Professor Z. Barzily
Assistant Professorial Lecturers K.R. Hoffman, J.F. Ince, H.D. Kahn, P.F.
McCoy, B.D. Nussbaum

Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, Doctor of Science, and to the Professional degree of Applied Scientist.

OPERATIONS RESEARCH AND COMPUTATIONAL SCIENCE PROGRAM—UNDERGRADUATE STUDY

Operations research and computational science can be described as the use of scientific methods in decision-making. It seeks to observe, understand, and predict the behavior of purposeful man-machine systems by taking a quantitative approach to management.

In today's complex world well-trained managers and decision makers are increasingly needed to apply mathematical concepts, scientific techniques, and management tools (*e.g.*, computers) to solving a wide variety of multi-faceted technical problems. These managers must be able not only to understand such problems, but they must also devise and implement solutions. This requires individuals who have a basic understanding of mathematics, the sciences, and engineering, combined with the analytical skills required to comprehend and plan a method of approaching and solving complex problems.

Techniques of operations research and computational science are designed to cope with problems of practical significance, which are often characterized by complicated and uncertain environments. These techniques have contributed to the solution of problems of choice, policy, and planning which have arisen in military, governmental, industrial, environmental, and social contexts.

The significant features of operations research and computational science—a broad range of potential applications and a wide variety of scientific techniques which can be selected and combined for a multidisciplinary approach—work together to make the profession a dynamic and exciting one. Operations research and computational science should be particularly considered by those who are attracted to the use of mathematics, statistics, engineering, and science in solving decision-making problems of practical significance.

Core Curriculum

The first four semesters of work concentrate on the fundamentals of science and mathematics, and also include study in English, the humanities, and the social sciences.

During the last four semesters the student concentrates on the professional courses in operations research, computer science, engineering administration, mathematics, and statistics. In addition, one technical elective each semester must be chosen and the student may choose *sets* of electives which offer concentration in areas such as engineering, mathematics, statistics, or environmental science.

First Semester

CSci 51: Applications of Computers (3)
Engl 9 or 10: English Composition: Language as Communication (3)
*Math 30–31: Precalculus and Single-Variable Calculus I (3)
or
Math 31: Single-Variable Calculus I (3)
Phys 3: Foundations of Physics (3)
Elective: Selected from humanities or social sciences (3)

Second Semester

EngS 4: Descriptive Geometry and Drafting (3)
Math 32: Single-Variable Calculus II (3)
Math 33: Multivariate Calculus (3)
Phys 14: Introduction to Mechanics and Thermal Physics (3)
Elective: Selected from humanities or social sciences (3)

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Chem 13: General Chemistry (4)
Phys 15: Elements of Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

CSci 52: Computers and Societal Problems (3)
ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
ApSc 116: Engineering Analysis IV (3)
Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

Fifth Semester

†OR 101: Survey of Operations Research Methods I (3)
CSci 157: Machine and Assembly Language Programming (3)
EAd 150: Introduction to Engineering Administration (3)
Math 124: Introduction to Matrix Theory (3)

*For students who have not successfully completed a college-level calculus course with a grade of C or better from an accredited institution, or high school students who did not take an advanced placement AP calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined precalculus and calculus course (Math 30–31) during their first semester. This combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

†Undergraduates will register for the 100-level courses but will attend lectures for the corresponding graduate courses; separate requirements and grading standards will be employed.

Elective: *One* technical elective selected from:
- EE 11: Linear Networks I (3)
- ME 131: Thermodynamics (3)
- CSci 155: Introduction to Numerical Methods for Computers (3)
- Math 153: Introduction to Numerical Analysis (3)

Elective: Selected from humanities or social sciences (3)

Sixth Semester

- OR 102: Survey of Operations Research Methods II* (3)
- CSci 152: Introduction to Digital Computers (3)
- EAd 160: Introduction to Engineering Economic Analysis (3)
- Stat 187: Theory of Sampling (3)

Elective: *One* technical elective selected from:
- EE 12: Linear Networks II (3)
- ME 126: Fluid Mechanics (3)
- Math 113: Graph Theory (3)
- Math 157: Introduction to Complex Variable Theory (3)

Elective: Selected from humanities or social sciences (3)

Seventh Semester

- OR 151: Linear Programming* (3)
- CSci 158: Algorithmic Methods and High-level Language (3)
- Stat 118: Regression Analysis (3)
- Math 139: Advanced Calculus I (3)

Elective: *One* technical elective selected from:
- EE 20: Introductory Engineering Electronics (3)
- EE 31: Fields and Waves I (3)
- ME 176: Environmental Engineering Problems (3)
- ME 191: Mechanical Design (3)
- CE 193: Hydraulics (3)
- Stat 188: Nonparametric Statistical Inference (3)
- Math 121: Introduction to Abstract Algebra I (3)

Eighth Semester

- OR 191: Problems in Operations Research* (3)
- CSci 159: Programming and Data Structures (3)
- Stat 117: Analysis of Variance (3)
- Math 140: Advanced Calculus II (3)

Elective: *One* technical elective selected from:
- EE 32: Fields and Waves II (3)
- EE 121: Engineering Electronics and Design (3)
- EE 172: Control Systems Design (3)
- EE 177: Electrical Energy Conversion (3)
- ME 148: Thermodynamic Analysis (3)
- ME 193: Engineering Systems Design (3)
- CE 110: Introduction to Environmental Engineering (3)
- CE 194: Environmental Engineering I: Water Supply and Resources (3)
- Math 154: Difference Equations (3)
- Stat 159: Principles of Bayesian Statistics (3)
- Math 122: Introduction to Abstract Algebra II (3)

* Undergraduates will register for the 100-level courses but will attend lectures for the corresponding 200-level courses; separate requirements and grading standards will be used.

Postgraduate Work

Upon completion of the four-year program, the student may choose to study one more year and obtain a Master of Science degree in Operations Research. Graduates of the Operations Research and Computational Science curriculum are given two credits of advanced standing which are applicable to the master's program.

OPERATIONS RESEARCH UNDERGRADUATE COURSES

101 Survey of Operations Research Methods I (3)

Basic concepts and techniques of operations research as applied to problems in industrial, governmental, and military decision-making. Allocation models, including the simplex procedure of linear programming, transportation and assignment models; queuing theory; inventory theory; game theory; and decision-making under uncertainty. Prerequisite: ApSc 115 or equivalent. (Fall and spring)

102 Survey of Operations Research Methods II (3)

Simulation, Monte Carlo techniques; networks; integer programming; introduction to nonlinear programming; dynamic programming; reliability and replacement. Prequisite: OR 101 or permission of instructor. (Fall and spring)

151 Linear Programming (3)

Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality problems; parametric linear programming and sensitivity analysis, transportation problems. Prerequisite: OR 101 or permission of instructor. (Fall and spring)

191 Problems in Operations Research (3)

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. (Fall and spring)

199 Honors Research (3)

As arranged.

MASTER OF SCIENCE DEGREE PROGRAM

The objective of the Master's program in operations research is to prepare students with appropriate undergraduate backgrounds for in-depth study of analytically oriented techniques of management decision-making and applications of these techniques.

Expanded scientific, statistical, and mathematical knowledge, combined with growing needs, in technological as well as social areas, has created increased demand for individuals trained in operations research. The discipline of operations research uses scientific principles supported by statistical and mathematical methodology to study the function and structure of complex industrial, military, and social systems in an effort to evaluate the probable effects of proposed courses of action, to establish criteria to judge the effectiveness of these courses, and to assist in the making of optimal decisions. The program in operations research provides a scientific basis for solving problems involving the interaction of many factors and organizational components in the interests of the

whole system. This breadth of interest is an example of the "systems appr
in the sense that a system is an interconnected complex of functionally re
components. Most operations research efforts begin with specific aspects
general problem and proceed to consideration of the system as a whole. Ju
the engineer may start with the study of subsystems or components of a ge
problem, so may the operations research analyst.

Admission

In addition to the requirements for admission to graduate study (see
27), the applicant for the program in operations research leading to the
ter of Science degree must have an adequate knowledge of probability
statistics. This requirement can be met by satisfactory completion of ApSc
and 116, or approved equivalents. It is generally possible to take these cou
concurrently with courses taken for graduate credit; however, these
graduate courses do not fulfill any part of the requirements for the Mas
degree.

Required Courses

Core courses required in the field of operations research are OR 201, 202, 20
210, and 299–300 (for those electing a thesis) or 291 (for those not electing
thesis). Students must complete OR 201, 202, 209, and 210 before attempti
any other courses; however, in certain cases permission may be granted
concurrent registration. Students electing OR 291 normally complete this cou
in the last semester of the program. The remainder of the program is selecte
with the approval of the adviser, in an area of concentration from courses in th
Department of Operations Research. Appropriate courses from other depart
ments of the University may also be approved as electives.

Areas of Concentration

The goal of the Department of Operations Research is to provide programs fle
ible enough to accommodate both those students who are interested in applica
tions and those who are interested in theory. Specific areas of concentration
and suggested departmental electives follow:

GENERAL OPERATIONS RESEARCH

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 261: Theory of Games
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the Department may be elected

ENERGY SYSTEMS

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

LOGISTICS ENGINEERING

OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Business Administration, Management Science, and Electrical Engineering and Computer Science.

MANAGEMENT SCIENCE

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Departments of Business Administration, Economics, Engineering Administration, and Management Science.

MATHEMATICAL MODELING IN INFORMATION SYSTEMS

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

MATHEMATICAL OPTIMIZATION

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer, Network, and Dynamic Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

MODEL BUILDING FOR TRANSPORTATION FLOWS

OR 231: Theory of Traffic Flow
OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning; and from the National Law Center.

OPERATIONS RESEARCH IN INDUSTRIAL ENGINEERING SYSTEMS

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

QUANTITATIVE DECISION-MAKING FOR PUBLIC POLICY

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

STOCHASTIC MODELING

OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

PROFESSIONAL DEGREE PROGRAM

This program of advanced study and research leads to the degree of Applied Scientist. The program is designed to provide an educational opportunity for students interested in pursuing post-Master's study with emphasis on applied subject matter rather than on basic research.

Admission

In addition to the general requirements for admission to Professional degree study (see pages 31–34), admission requires an appropriate Master's degree from a recognized institution and evidence of a capacity for productive work as indicated by prior scholarship. The applicant must also possess a bachelor's degree in either engineering, mathematics, or administration. In certain cases, applicants having an equivalent quantitative background may be considered for admission by the Department.

Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-Department minor. A minimum of 30 semester hours is required to earn the Professional degree, including a minimum of 12 hours in operations research, Stat 201–202, and a three-hour Professional degree project. In addition, a nine-hour applied minor outside the department is required. Appropriate minor areas include economics; engineering administration; systems analysis, computer science; systems science, networks and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems.

DOCTOR OF SCIENCE DEGREE PROGRAM

Programs in operations research leading to the degree of Doctor of Science provide advanced study and research to enable students to extend their fields of knowledge and to enhance their career opportunities in research, analysis, management, administration, or education.

Admission

In addition to the general requirements for admission to doctoral study (see page 34), the applicant for the doctoral program in operations research must have a Master's degree, with a superior record of academic achievement. Outstanding professional performance is also considered in evaluating applicants.

Programs of Study

Doctoral programs are planned so that the student may obtain adequate breadth in operations research and sufficient depth in areas of specialization which will enable the completion of a dissertation that will be a significant contribution to the field. Possible areas of concentration include mathematical programming, sequencing and scheduling, inventory, queuing, and reliability. In addition to the major in operations research, two minor areas of concentration are normally required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from areas of concentration within the Department or from appropriate areas available in other departments of the University, such as Business Administration; Civil, Mechanical, and Environmental Engineering; Economics; Electrical Engineering and Computer Science; Engineering Administration; Health Services Administration; Management Science;

and Urban and Regional Planning. The general requirements for doctoral pro
are stated on pages 34–38.

PROFESSIONAL FIELDS AND RESEARCH INTERESTS OF OPERATIONS RESEARCH FACULTY

	Areas of Specialization	Areas of Recent Resea
Zeev Barzily	Applied probability Queuing theory Stochastic processes	GI/G/1 queues Traffic models Detection of shift in transition probabilities of Markov chains
James E. Falk	Mathematical programming Numerical methods Mathematical modeling	Nonconvex programmi Sequential optimizatio problems Sequential games Application of optimiza tion methods to economics, military, logistics, and location problems
Anthony V. Fiacco	Mathematical programming Numerical methods Mathematical modeling	Penalty function method Approximation and sen sitivity analysis in non linear programming Construction and valida tion of algorithms Nonconvex programmi techniques General applications
Donald Gross	Inventory theory Queuing theory Simulation	Queuing approximation Inventory models Applications Risk analysis
W.H. Marlow	Mathematical methods and numerical procedures in operations research and management science	Logistics Systems effectiveness
Garth P. McCormick	Mathematical programming Numerical methods Mathematical modeling	Rate of convergence of algorithms Nonconvex programming Mathematical programming applied to pollution problems and conservation of resources Energy modeling

Douglas R. Miller	Applied probability Stochastic processes Simulation Mathematical statistics	Risk analysis Maintenance models Bounds and approximations for stochastic processes Statistical inference using empirical distributions Stochastic models in chemical processes
Nozer D. Singpurwalla	Applied probability and mathematical statistics Reliability theory Time series analysis and forecasting Fault tree analysis	Applications of time series analysis Bayesian decision theory Extreme value theory and applications Nonparametric characterizations of distributions and their testing Models in air pollution and flood discharges
Richard M. Soland	Mathematical modeling Decision theory Mathematical programming	Optimal facility location Interactive multicriteria optimization Multicriteria decision models in the public and private sectors Solution and applications of the generalized assignment problem Stochastic models for the analysis of bus route duration Risk analysis

PERATIONS RESEARCH GRADUATE COURSES

201 Survey of Operations Research Methods I (3)

Basic concepts and techniques of operations research as applied to problems in industrial, governmental, and military decision-making. Allocation models, including the simplex procedure of linear programming, transportation and assignment models; queuing theory; inventory theory; game theory; and decision-making under uncertainty. Prerequisite: ApSc 115 or equivalent. (Fall and spring)

202 Survey of Operations Research Methods II (3)

Simulation and Monte Carlo techniques, networks, integer programming, introduction to nonlinear programming, dynamic programming, reliability and replacement. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

209 Mathematics in Operations Research I (3)

Fundamental methods and practical procedures for deterministic decision models in operations research involving a number of variables. Applica-

tions of linear models for resource allocations. Applications to data re-
resentation and algorithmic procedures for linear and nonlinear optimiza-
tion models. Applications of linear algebra and real multivariate analysis.
(Fall and spring)

210 Mathematics in Operations Research II (3)

Fundamental methods and practical procedures for stochastic decision
models in operations research involving applications of complex variation.
Applications of linear differential, difference, and differential-difference
systems to various areas in operations research. Applications of modern
numerical methods. (Fall and spring)

231 Theory of Traffic Flow (3)

Definitions and measurement of traffic stream parameters, dynamic the-
ories: follow-the-leader models of traffic flow, kinematic theories and their
analogies, traffic cybernetics, statistical distributions and queuing theory,
stochastic approaches to static delay problems, simulation of traffic prob-
lems. Prerequisite: ApSc 115 or equivalent. (Spring, odd years)

232 Applications of Linear and Nonlinear Optimization Theory (3)

Introduction to penalty-function methods for solving linear and nonlinear
optimization problems through use of existing computer codes. Formula-
tion of optimization models in application areas of structural design, nu-
trition, pollution control, inventory control, energy, economics, psychology,
statistics, and chemical processes. Admission by permission of instructor.
(Fall)

237 Logistics Planning (3)

Quantitative methods in model building for logistics systems including or-
ganization, procurement, transportation, inventory, maintenance, and their
interrelationships. Applications stressed. Prerequisite: ApSc 115 or equiv-
alent. (Spring, even years)

251 Linear Programming (3)

Basic computational, theoretical, and applied areas with emphasis on the
general linear programming problems; simplex procedures: duality prob-
lems; parametric linear programming and sensitivity analysis, transporta-
tion problems. Prerequisite: OR 201 or permission of instructor. (Fall
and spring)

252 Nonlinear Programming I (3)

Basic topics in optimization theory, including first- and second-order op-
timality criteria, convexity, duality, and algorithms. Methods for solving
unconstrained, linearly constrained, and nonlinearly constrained prob-
lems. Applications discussed where appropriate. Prerequisite: OR 202 or
permission of instructor. (Spring)

253 Integer, Network, and Dynamic Programming (3)

Methods and applications of optimization problems requiring integral solu-
tions. Cutting plane methods, branch and bound methods, group theoretic
methods. Dynamic programming. Network programming: shortest route
problems, max flow problems. Prerequisite: OR 202, 251; or permission
of instructor. (Fall, even years)

261 Theory of Games (3)

Study of mathematical models with applications to the relationships among
independent competitive entities (persons or organizations in environments

of competition, bargaining, bidding), selection of optimum strategies, minimax concept, connections with linear programming and decision functions, two-person and n-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

271 **Forecasting Techniques** (3)

Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box-Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Techniques covered will be applied to engineering, business, and economic situations, using special computer program packages. Prerequisite: ApSc 115, 116; or equivalent. (Spring, even years)

273 **Digital Systems Simulation** (3)

Monte Carlo techniques, random number and random deviate generation. Simulation languages. Operating considerations, including model validation, steady-state, and statistical analyses of simulation output. Applications in inventory, queuing, and production scheduling. Prerequisite: OR 201, 202, or permission of instructor; and knowledge of FORTRAN or BASIC. (Spring, odd years)

275 **Introduction to Scheduling** (3)

Theory of scheduling with emphasis on industrial applications, assembly line balancing, sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems are examined. Prerequisite: OR 201, 251; or permission of instructor. (Fall, odd years)

277 **Queuing Theory** (3)

Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth-death processes, finite sources, bulk queues, Erlangian models, and series queues. Models with general arrival and/or service patterns. Model-building, basic solution techniques, and formal theoretical developments are stressed. Prerequisite: ApSc 116, OR 201; or permission of the instructor. (Spring)

279 **Inventory Control** (3)

Application of mathematical techniques to decisions regarding when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints. Demand uncertainty and forecasting in inventory models. Prerequisite: OR 201 or permission of instructor. (Fall)

281 **Reliability Theory I** (3)

Topics introducing the mathematical and statistical theories of reliability. Mathematical theory includes the theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, and bounds and inequalities. Statistical theory includes probabilistic derivation of failure models; testing goodness-of-fit; censored, truncated, and sequential life testing procedures using classical and Bayesian techniques; testing reliability hypotheses and their applications in the commonly used military standard plans. Prerequisite: ApSc 115, 116; or equivalent. (Fall)

291 Problems in Operations Research (3)

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. Prerequisite: Knowledge of FORTRAN or BASIC. (Fall and spring)

297 Special Topics in Operations Research (3)

Selected topics in operations research, as arranged. Prerequisite: permission of instructor. May be repeated for credit. (Fall and spring)

298 Research (arr.)

Basic or applied research in operations research. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

351 Advanced Topics in Mathematical Programming (3)

Special topics selected from fractional and geometric programming, branch-and-bound methods, max-min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 Nonlinear Programming II (3)

Convex analysis, algorithmic convergence, and rate of convergence. Proof of optimality conditions. Factorable programming and other problems with special structures. Matrix methods, sensitivity analysis, and nonconvex optimization. Prerequisite: OR 252 or permission of instructor. (Fall)

361 Decisions and Value Theory (3)

Subjective probability and utility theory. Optimal nonsequential and sequential decision processes: Bayes risks and Bayes decisions, randomized and mixed decisions. Optimal stopping. Prerequisite: ApSc 116, OR 202 (OR 261 is desirable); or permission of instructor. (Spring, [illegible] years)

371 Advanced Topics in Forecasting (3)

Continuation of OR 271 designed for those who wish to develop further capability in this area. Topics include a brief review of OR 271, estimation of parameters of Box-Jenkins models, transfer function models relating two or more time series, models for intervention analysis, models for feedforward and feedback control schemes. Also, other techniques and concepts useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or equivalent or permission of instructor. (Fall, even years)

377 Advanced Stochastic Models in Operations Research (3)

Selected applied probability models, including Brownian motion, renewal theory, denumerable Markov chains, semi-Markov processes, and Markov decision problems. Applications to topics in advanced queuing and inventory theories, including busy periods, waiting times, imbedded Markov chains, and GI/G/1 queues; and conditions for optimality of (s, S) policies, stochastic leadtime problems, state-dependent leadtimes, [illegible]

multi-echelon problems. Prerequisite: OR 277, 279; or permission of instructor. (Fall, odd years)

381 **Reliability Theory II** (3)

Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, stochastic majorization and its applications, and reliability theory for multi-state components. Statistical theory includes total time on test processes and plots, goodness-of-fit tests using total time on test plots, estimation and forecasting failure rates, and comparison of stochastic processes. Prerequisite: OR 281. (Spring, even years)

391 **Project for Professional Degree** (3)

Limited to students in the Professional degree program. (Fall and spring)

397 **Advanced Topics in Operations Research** (3)

Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)



Required Courses in Engineering Undergraduate Curric
Offered by Columbian College of Arts and Sciences and by
Graduate School of Arts and Sciences

For convenience, descriptions of required courses in undergraduate curric which are offered by Columbian College of Arts and Sciences and the Gradu School of Arts and Sciences are listed here. See the *Undergraduate and Gra uate Bulletin* for elective courses in the humanities and social sciences.

BIOCHEMISTRY

221–22 General Biochemistry (3–4)

A comprehensive course in general biochemistry for graduate stude in biomedical sciences and undergraduate students in biology and che istry. Generally, graduate students *must* register concurrently for Bioc 22 and for Bioc 224. However, graduate students taking Bioc 225–26, Fo 281–82, Micr 241–42, or Phys 223–24 may register for Bioc 221–22 w out the laboratory. With specific recommendations by the undergradu adviser and the Department, undergraduate students may register for B 221–22 without the laboratory. Prerequisite: Chem 152, 154. (A demic year)

BIOLOGICAL SCIENCES

Biology

11–12 Introductory Biology for Science Majors (4–4)

Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concep and principles are demonstrated through consideration of the plant as organism. BiSc 12: Beginning principles of inheritance, developme behavior, physiology, systematics, and evolution, using animals as subject of investigation; designed to furnish a base for advanced study in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Ma terial fee, $24 a semester. (Academic year)

Zoology

145 Introduction to Vertebrate Embryology (4)

Lecture (2 hours), laboratory (4 hours). Origin and early developme of the individual, formation of organ systems. Emphasis on frog, chi and pig, with reference to human embryo. Material fee, $24. (Fa

148 Histology (4)

Lecture (2 hours), laboratory (4 hours). Introduction to microscopic anatomy of normal tissues and organs with emphasis on the interrel tionship of structure and function. Material fee, $24. (Fall and spring

CHEMISTRY

13 General Chemistry (4)

For engineering and applied science students only. Lecture (3 hours laboratory (3 hours), recitation (1 hour). Atomic structure, chemica

bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $28. (Fall)

22 **Introductory Quantitative Analysis** (4)

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

151–52 **Organic Chemistry** (3–3)

Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 **Organic Chemistry Laboratory** (1–1)

Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. (Academic year)

NGLISH

*9 **English Composition: Language as Communication** (3)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure in writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours a week for a maximum of 10 weeks. Special fee, $25. (Fall and spring)

*10 **English Composition: Language as Communication** (3)

Study and practice of expository techniques: emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

EOLOGY

136 **Engineering Geology** (3)

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or permission of instructor. (Spring)

ATHEMATICS

30–31 **Precalculus and Single-Variable Calculus I** (3)

A one-semester combination of Math 30 *Precalculus* and Math 31

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udents whose College Board English Composition Achievement Test scores suggest inadequate paration may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standusage, and writing skill, before placement in either Engl 9 or 10. Students whose scores and/ writing skill indicate superior competence will be allowed to waive the Engl 10 requirement.

ansfer students who have not successfully completed a college-level calculus course with a grade C or better from an accredited institution, or high school students who did not take an advanced ement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to a one-hour locally administered math placement test at registration. This test covers algebra, nometry, and graphs. Students who do not place directly into Math 31 as a result of this test be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their semester, this combined course meets five hours per week and carries three semester hours of t if the student successfully completes the second half (Math 31) of the combined course.

Single-Variable Calculus I. The course meets five hours per week and carries three semester hours of credit. After completing the first half of the course (Precalculus), students are examined in precalculus. Students who pass the test continue in Math 30–31. Students who fail the test transfer to a regular Math 30 course for the remainder of the semester. (Fall and spring)

30 **Precalculus** (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry, and one-half year of high school trigonometry; or equivalent. (Fall and spring)

31 **Single-Variable Calculus I** (3)

Differentiation and integration of algebraic functions, exponentials and logorithms with simple applications. Analytic geometry. Prerequisite: Math 30 or equivalent. (Fall and spring)

32 **Single-Variable Calculus II** (3)

Calculus of trigonometric functions. Techniques of integration. Indefinite series; vectors; three-dimensional analytic geometry. Prerequisite: Math 31. (Fall and spring)

33 **Multivariate Calculus** (3)

Vector-valued functions. Partial differention. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

32–33 **Single-Variable Calculus II and Multivariate Calculus** (6)

A one-semester combination of Math 32 and 33, meeting five hours per week.

113 **Graph Theory** (3)

Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 **Introduction to Abstract Algebra** (3–3)

Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

124 **Introduction to Matrix Theory** (3)

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

139 **Advanced Calculus I** (3)

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall and spring)

140 **Advanced Calculus II** (3)

Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

153 **Introduction to Numerical Analysis** (3)

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent. (Fall, even years)

154 **Difference Equations** (3)

Introduction to finite difference equations and their solution. Physical examples and analogies with differential equations are employed to motivate and apply the techniques developed. Generating functions. Analysis of error and stability characteristics. Prerequisite: Math 111 or 139; or equivalent. (Spring, odd years)

157 **Introduction to Complex Variable Theory** (3)

Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

YSICS

3 **Foundations of Physics** (3)

Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat and electromagnetism, including the classical concepts of energy, momentum, heat, temperature, entropy, electric and magnetic fields, optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. (Fall, spring, summer)

14 **Introductory Mechanics and Thermal Physics** (3)

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Fall, spring, summer)

15 **Elements of Electricity and Magnetism** (3)

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's law, Gauss' Law, electric potential, capacitance and dielectrics, electric current and resistance. Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18. (Fall, spring, summer)

16 **Introduction to Modern Physics** (3)

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to basic principles of quantum theory. Topics include wave-par-

ticle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisite: Phys 14, 15, Math 32. Laboratory fee, $18. (Fall, spring, summer)

STATISTICS

117 **Analysis of Variance** (3)
Lecture (3 hours), laboratory (1 hour). Introduction to the design of experiments and analysis of variance; random block, factorial, Latin square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $18. (Spring)

118 **Regression Analysis** (3)
Lecture (3 hours), laboratory (1 hour). Regression and correlation theory; simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91. Laboratory fee, $18. (Fall and spring)

159 **Principles of Bayesian Statistics** (3)
Lecture (3 hours), laboratory (1 hour). Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semester hours in introductory statistics, or equivalent. Laboratory fee, $13.

187 **Theory of Sampling** (3)
Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3)
Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)



ENERAL INFORMATION



egistration

he dates, hours, and place of registration will be stated in the *Schedule of lasses*, which is available well in advance of each semester.

New and readmitted students cannot register for classes without having reived a letter of admission to the University issued by the appropriate admitg office.

No registration is accepted for less than a semester or less than one summer ssion.

Students may not register concurrently in this University and another instiion without the prior permission of the dean of the college, school, or divin in which the student is registered in this University. Registration in more an one college, school, or division of the University requires the written perission of the deans concerned, prior to registration. Allowance of credit for ork done concurrently at another institution is at the discretion of the appropiate committee.

LIGIBILITY FOR REGISTRATION

egistration for the following categories of campus students is held on the days registration stated in the University Calendar. A student who is suspended whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a letter of admission, the new student is gible for registration on the stated days of registration.

Readmitted Student.—A student previously registered in the University who s not registered for campus courses during the preceding semester or sumer session must apply for and receive a letter of readmission from the appropiate admitting office before the student is eligible for registration.

Continuing Student.—The student registered for campus courses in the imediately preceding semester or the Summer Session preceding the fall semes- is eligible to register, assuming good standing and enrollment in a continus program.

EGISTRATION CHANGES AND WITHDRAWALS (see pages 209–10, 217–18)

egistration for Consortium Courses

gree students interested in taking courses at any of the other institutions in Consortium of Universities of the Washington Metropolitan Area, Inc. ould consult the program announcements of the other institutions. Con-

sortium application forms and instructions may be picked up in the Office of the Registrar after obtaining registration materials. In order to participate in the Consortium program, students must obtain the approval of an adviser and should ascertain from the department of the institution where the course is taught whether they are eligible for the course and whether there is space in the class. Specific inquiries should be addressed to the Registrar.

Fees and Financial Regulations

Fees paid by students cover only a portion of the cost of the operation of the University. Income from endowment funds, grants, and gifts from alumni and friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 1980 summer sessions and the 1980–81 academic year. (See page 208 for projected tuition and fee increases for 1981–84.)

Tuition Fees

For undergraduate study:

Full-time program (12 or more hours per semester)	$1,850.00
Part-time program, for each semester hour	137.00
Summer Sessions, for each semester hour	129.00

For graduate study*

For each semester hour for which the student registers	137.00

Doctoral students are required to register for minimum hour-loads,† as follows:

1. Full-time doctoral students must register for a minimum of 12 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.
2. Part-time doctoral students must register for a minimum of 6 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and for a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.

Energy Surcharge—Because the price of fuel oil has risen out of proportion to the projected increase of tuition fees, and because this price is anticipated to rise even further in 1980–81 by an indeterminate amount, an energy surcharge will be assessed at the time of registration. The amount of this surcharge will be determined and announced prior to July 1, 1980.

* Registration in thesis courses (299-300) entitles the student, during the period of registration, to the advice of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished an additional semester will be granted. If the preparation of the thesis extends beyond the three-semester period, approval for this extension will be required, and the student must repeat the thesis course 300 and pay tuition as for a repeated course, provided the overall time limit for earning the degree is not exceeded.

† No minimum hour-load is required during the summer sessions.

iversity Center Fee

harged all students registered on campus*)

or students registered for 11 or more semester hours on campus:

Each semester $50.50

or students registered for less than 11 semester hours on campus:

For each semester hour for which the student registers $4.75

dditional Course Fees

certain courses additional fees, such as laboratory and material fees, are charged indicated in the course description. These fees are charged by the semester and, nless otherwise indicated, may be defrayed in two payments when the tuition is paid this manner. Breakage of apparatus is charged against the individual student. When reakage is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by he department concerned.

raduation Fees

ll degrees offered by the School of Engineering and Applied Science..... $25.00

ee for binding Master's thesis 15.00

ee for microfilm service and printing announcement of final examination for Doctoral degree 65.00

Residence Hall Fees (see page 226).

pecial Fees and Deposits

pplication fee (undergraduate degree candidates) nonrefundable $15.00

pplication fee (graduate degree candidates), nonrefundable..... 25.00

dvanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student 100.00

ousing deposit, nonrefundable, charged each applicant for residence hall space 100.00

dmission tests (when required) 6.00–12.00

ate-registration fee, for failure to register within the designated period.... 15.00

ate-payment fee, for failure to make payments when due (see "Payment of Fees" below) 15.00

inancial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees" below) 35.00

eturned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason..... 15.00

ngineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof except the summer term 5.00

pecial Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both 25.00

or each waiver examination to qualify for advanced placement 5.00

nglish test for international students (when required) 10.00

aboratory checkout fee, for failure to check out of chemistry laboratory by the date deadline set by the instructor† 10.00

*Students in off-campus programs are charged the University Center Fee only when registered for courses on campus.

†A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next regular laboratory period.

Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the services of the Student and Alumni Career Services Office; (2) the use of the University Library; (3) gymnasium privileges; (4) admission to all athletic contests, unless otherwise specified; (5) subscription to the *University Hatchet*, the student newspaper; (6) admission to University debates; (7) medical attention as described under Student Health Service. These privileges terminate when the student withdraws or is dismissed from the University.

PROJECTED TUITION AND FEE INCREASES FOR 1981–84

In order that students and their parents may plan more realistically for a total four-year period, tuition increases for the academic years 1981–82, 1982–83, and 1983–84 have been established as follows:

Increase by year (full-time undergraduate students):	
1981–82	$200.00
1982–83	400.00
1983–84	400.00
Increase by semester hour (graduate and part-time undergraduate students):	
1981–82	$ 8.00
1982–83	14.00
1983–84	15.00

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semes-

rs. Interest at the rate of eight per cent per annum on the unpaid balance ill be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government ition contracts, or other forms of tuition awards are not permitted to sign eferred payment contracts unless the total tuition and fee charges exceed the alue of the tuition awards by $750 or more. Under such circumstances the udent may be permitted to pay one-half of the amount due from the student t the time of registration and to defer the balance by signing a deferred pay- ent contract.

Students who fail to make any payment when due will be automatically harged a $15 late-payment fee and will be subject to the interest charge of ght per cent per annum. Accounts which become 30 days past due will be nancially encumbered. In the event a student's account is financially encum- ered, the student forfeits his right to the use of deferred payment contracts in ture semesters, and the Student Accounts Office will notify the Registrar to ithhold grades, future registration privileges, transcripts, diplomas, and other ademic information until the account is settled financially. Financial settle- ent will require payment in full of all amounts due the University in addi- on to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students regis- ered for credit.

eturned Checks

student whose check is returned unpaid by the bank for any reason will be harged a returned check fee. If the check is not paid within 15 days, the udent will forfeit all rights to check cashing at the University, and future ayments for tuition, dormitory, food service, and other special fees will re- uire payment by cash, certified check, or money order.

REPAID AND DEFERRED PAYMENT PLANS FOR PARENTS

everal commercial programs for parents who wish to pay for college on a onthly basis are available. Terms and conditions vary, but most provide a life surance policy in the contract. For specific details and applications, address quiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301
4. School-Chex, Irving Trust Company, P.O. Box 12231, Church St. Station, New York, N.Y. 10249.

The University's Office of Student Financial Aid does not maintain a supply f applications for these various programs, but will be happy to provide guid- nce to students and parents.

ITHDRAWALS AND REFUNDS*

pplications for withdrawal from the University or for change in class schedule re made by completing the George Washington University Change Slip (ob- inable in Room 103, Tompkins Hall), securing the approval of the appropri-

* Regulations concerning withdrawals and refunds for the Summer Sessions are stated in the *Summer Sessions Schedule of Classes.*

ate faculty, and submitting the form to Room 103 for the dean's signature. Notification to an instructor is not an acceptable notice (see "Withdrawal," pages 217–18.)

Withdrawal and Change in Course Status

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Associate Dean.

The status of a course may not be changed from credit to audit or vice-versa after the 28th day after classes have started for the semester.

For other regulations governing withdrawal and changes in program, see pages 217–18.

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:
   Withdrawal dated on or before Saturday of the *first* week of classes....90%
   Withdrawal dated on or before Saturday of the *third* week of classes....75%
   Withdrawal dated on or before Saturday of the *fifth* week of classes....50%
   Withdrawal dated after the fifth week of classes .....none
2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference between charges for the original program and the adjusted charges for the revised program.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. A student who is granted leave before completing the semester will receive credits for current charges in accordance with the schedule for complete withdrawal from the University (see No. 1, above). Payments made in excess of the nonrefundable balance will be refunded to the student.
5. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

In no case will tuition be refunded or reduced because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid*

FOR UNDERGRADUATE STUDENTS

George Washington University offers a program of financial assistance of two basic types: awards for academic achievement without reference to finan-

* For information concerning financial aid for students from foreign countries, see page 215.

nal circumstances—honor scholarships; and scholarships, grants, loans, and employment based upon demonstrated financial need. Applicants may apply for only *one* type of aid: need-based or honor.

Academic Merit Only

Engineering Honors Scholarships (EHS)

This program was initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of merit only and "financial need" is not a requirement for consideration. Applicants with financial need should apply for need-based aid, *not* for EHS. The EHS is available to entering freshmen and to transfer students who have (or will have by the time of entrance to SEAS) compiled 30 credit hours of college-level work which includes 6 credit hours of calculus or higher math and 3 credits of either physics or chemistry.

These scholarships cover one-half the tuition costs of attending SEAS and will be awarded to qualified students for up to four years, as long as scholarship criteria are met with the option of a fifth year if the student wishes to obtain a Master's degree.

Minimum Criteria for Initial Consideration of Incoming Freshman

The minimum criteria in the EHS Program will be based on merit in which the student has:

—achieved a minimum combined SAT score of 1250 or better; or an average ACT score of 28 or better in the English/mathematics/science tests; and ranked in the upper 10% of the class over 3 years or more;

or

achieved a minimum combined PSAT score of 125 or better;

—ranked at the end of the junior year in the upper 10% of the class over a period of 3 years or more;

—achieved an average grade of 85%, or better, at the end of the junior year, in mathematics and science courses taken during the previous 3 years.

Minimum Criteria for Initial Consideration of Incoming Transfer Students

The minimum criteria in the EHS Program will be based on merit in which the student has:

—completed (or will have completed at the end of the present semester) 30 credit hours in an accredited community college, college or university;

—completed courses which must include, at least, 6 credit hours of college calculus or higher mathematics, and, at least, 3 additional hours of college level physics or chemistry;

—achieved an overall quality point index of at least 85% (3.4) and a combined average of 80% (3.2) in the mathematics and science courses.

Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the

National Direct Student Loan, Basic Educational Opportunity Grant, Supple mental Educational Opportunity Grant, and the College Work-Study program

Applications and supporting credentials for financial aid other than Eng neering Honors Scholarships must be filed by February 1 (entering freshmen or March 3 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 3 for th spring semester; and by April 1 for the summer sessions.† A student must re apply for financial aid each year.

Application deadlines for Engineering Honors Scholarships vary according to the category of student. Applicants with financial need should apply fo need-based aid, *not* for EHS. Information on deadline dates is contained i the application forms.

Complete information concerning financial assistance is contained in th pamphlet, "On the Trail of Student Financial Aid," which is available at the Office of Student Financial Aid, George Washington University, Washington D.C. 20052.

Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry a full schedule of academic work during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science. The University also offers other scholarships which are open to engineering students.

Frederick Albert and Alma Hand Britten Scholarships (1959)—Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Available for undergraduate and graduate study.

American Association of Cost Engineers Scholarship (1977)—Established by American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum which includes courses related to cost engineering.

Atlantic Research Corporation Scholarship (1979)—Established by the Atlantic Research Corporation for both graduate and undergraduate students. The scholarship for undergraduates includes full tuition, books, and fees for students in their senior year only. Graduate students receive full tuition, books, and fees for one year of full-time graduate work. Recipients of the award must have an overall *B* average and must agree to accept employment with Atlantic Research Corporation for one year after graduation. Awards are offered both on a financial-need and a non-financial-need basis.

Henry Harding Carter Scholarship (1896)—Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

Henry Parsons Erwin Scholarship (1955)—Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in Engineering and Applied Science.

† Summer Sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester.

Louis E. Giles Memorial Scholarships (1966)—Bequest of Susie E. Giles in honor and memory of her husband for scholarships to undergraduate and graduate students in the School of Engineering and Applied Science requiring financial assistance.

The George Hyman Construction Company Scholarships (1974)—Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial tuition undergraduate scholarships begin in the fall semester and extend for four years, provided the holder maintains a *B* average based upon a full course load leading to a degree in civil engineering and continues to be in financial need.

National Fund for Minority Engineering Students Scholarship (1977)—Scholarship for minority students who require financial assistance of up to $3000 and are in good academic standing. Minority students are defined as full time students of black, Puerto Rican, American Indian or Chicano descent, who are U.S. citizens or permanent residents, and who are entering an engineering school or university for the first time.

George Washington University Board of Trustees Scholarships—Full and partial tuition undergraduate scholarships which begin in the fall semester and extend for four successive academic years, provided the holder maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a Bachelor's degree.

FOR GRADUATE STUDENTS

Scholarships, Fellowships, Assistantships

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, the application and supporting credentials should be submitted not later than February 1 preceding the academic year for which the award is made.

Frederick Albert and Alma Hand Britten Scholarships (1959)—See p. 212.

American Association of Cost Engineers Scholarship (1977)—See p. 212.

Louis E. Giles Memorial Scholarships (1966)—See above.

Phi Delta Gamma Scholarship Endowment Fund (1968)—Established by the Beta Chapter of Phi Delta Gamma, national fraternity for graduate women. For graduate women students.

National Science Foundation Graduate Fellowships—Fellowships leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences, and in the history and philosophy of science; providing tuition, fees, and stipends. Open to students who have been admitted to graduate status and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Research Assistantships in Operations Research and Related Fields—Available to graduates, and to undergraduates on the junior and senior levels, in any school of the University. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program or in programming or in conducting individual research on an approved research project. Stipends range up to $8,500, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Research Assistantships in Engineering Administration—Available to graduates in any Engineering Administration program. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program. Stipends range up to $8,500 depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from the Chairman, Department of Engineering Administration.

Research Scholar Assistantships, GWU/NASA-Langley Program—See page 42.

Resident Assistantships (men and women)—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part-time, and staff members are required to enroll as full-time students in degree granting programs. Further information may be obtained from the Office of the Director of Housing.

SPONSORED AWARDS FOR GRADUATE STUDY

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others which may be used in support of graduate study is available at the Graduate Fellowship Information Center, 2025 H St., N.W., for students enrolled at George Washington University. Information is also available on distinguished programs such as the Rhodes, Marshall, National Science Foundation, Fulbright, Rotary International, and Danforth as well as many others.

Since deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

LOAN FUNDS

Several loan funds are available to students in the University in accordance with the qualifications specified by the donors. Two loan programs limited to students in the School of Engineering and Applied Science are available. Students should direct inquiries to and file applications with the Office of Student Financial Aid. Applications for the National Direct Student Loan should be filed no later than April 1 for the following academic year. Complete information is contained in the pamphlet, "On the Trail of Student Financial Aid," available in the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Warren Stickler Memorial Loan Fund (1966)—A fund established by the Precision Measurements Association as a memorial to Warren Stickler is available to engineering students.

John Brewster Willis, Jr., Loan Fund in Mechanical Engineering—Established by Mrs. William L. Lane as a memorial to her nephew, John Brewster Willis, Jr. Available to Mechanical Engineering students (graduate or undergraduate) who are primarily interested in aeronautics.

Two short-term emergency loan funds are also available at the University. Information concerning these funds is available from the Office of Student Financial Aid.

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Student and Alumni Career Services Office maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Career Services Office, Woodhull House, 2033 G Street, N.W., for interviews and referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, page 202.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is at a minimum approximately $7,300. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

Prizes

Norman B. Ames Memorial Award—Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by his fellow students as having made significant contributions to the students in the School of Engineering and Applied Science, to the School, and to the University.

Deacon Ames Activities Award—A plaque awarded annually by Gamm Beta Chapter of Theta Tau Fraternity to the senior in the School of Eng neering and Applied Science with the most outstanding record in activities fo the entire period of attendance.

Martin Mahler Prize in Materials Testing—A one-year membership in th American Society for Testing Materials awarded to the upper division or grad uate student in engineering who submits the best reports on tests in the mate rials laboratories course with preference given to prestressed concrete tests.

Alfred Martin Freudenthal Prize—Established as a memorial to Professo Freudenthal by his wife, friends, students, and colleagues for his outstandin contributions to engineering education. This honor for academic excellence i awarded annually to the senior who graduates with the highest scholastic stand ing. The student will receive a cash award, and his/her name will be engrave on a plaque displayed in Tompkins Hall.

Regulations

A student enrolled in the School of Engineering and Applied Science is re quired to conform to the following regulations.

A student who withdraws or is suspended or who, for any other reason, is not registered at the University for one semester or more, may re-enter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material informa tion on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the Univer sity, the student may be subject to dismissal from the University. Such a stu dent will be ineligible for subsequent registration in the University except by special action of the Faculty.

ACADEMIC DISHONESTY

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incom ing students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking ex aminations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishon esty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University Policy on Academic Dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

CHANGES IN PROGRAM OF STUDY

A student may not make any changes in an approved program of study without the approval of the Associate Dean. Requests for changes in class registration must be made on a form provided in the School's Admission office.

During the seven days following the first day of classes of a semester, courses may be added to the student's program with the approval of the instructor, the faculty adviser, and the Associate Dean.

WITHDRAWAL

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

Applications for withdrawal from the University or for changes in class scheduling must be made in person or in writing to the individuals indicated below. Notification to an instructor is not an acceptable notice.

Regular Withdrawal—Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Associate Dean.

Late Withdrawal—Withdrawal from any course without academic penalty after the 28th day following the first day of classes of a semester may be granted with the approval of the instructor, the student's adviser, the chairman of the department in which the student is enrolled, and the Associate Dean. Requests for late withdrawal must be submitted to the Associate Dean's office on the appropriate form and must be accompanied by a drop-add slip. Late withdrawals may be granted only under the following conditions:

1. The request is made necessary by exceptional circumstances such as certified medical absence or forced absence caused by work-related requirements
2. The grades in all courses involved are *C* or better for graduate students, and *D* or better for undergraduate students as of the date of the request.

In all cases, financial regulations governing withdrawal remain in full effect.

Change in Course Status—The status of a course may not be changed from credit to audit or vice-versa after the 28th day after classes have started for the semester.

Full tuition is charged for courses dropped without the approval of the Associate Dean. Such unauthorized withdrawal will result in the recording of a failing grade for the course or courses. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

CREDIT

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the granting of advanced standing.

Auditing—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Balance Sheet—On request the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Post-admission Transfer Credit—A student who plans to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the Department Chairman, and the Associate Dean, on a form available in room 103, Tompkins Hall. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

GRADUATION REQUIREMENTS

To be recommended by the faculty for graduation, a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing de-

ee requirements during the summer sessions will be awarded diplomas (no rmal convocation) dated September 30, provided they have completed all egree requirements and have applied for graduation as a part of registration the summer sessions.

tendance and Conduct—The University reserves the right to refuse to con- a degree upon a candidate whose attendance or conduct has been unsatis- ctory.

udent Records—Information on the status of credit, transfer-of-credit awards, lance sheets, and other information relating to graduation may be obtained Room 103, Tompkins Hall.

ea of Concentration Certificate—Upon successful completion of the Mas- 's degree the student, by means of a written request to the appropriate De- rtment Chairman, may obtain a certificate indicating the area of concentra- n.

E LIBRARY

l students registered in the University have the privilege of using the Uni- sity Library. Its stacks are open, and all students are welcome to browse. card denoting approved enrollment for the current semester must be pre- ted when books are borrowed for outside use.

The loan period for stack books is 14 days. Any book which circulates is ject to recall by the library if needed for reserve or other use. Reserve oks must be used in the reserve reading room when the library is open, cept that they may be withdrawn for overnight use beginning at 8:30 p.m. anscripts of grades are withheld until a student's library record is clear, with borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar with detailed regulations, available at any of the library's service desks.

NIVERSITY POLICY ON THE RELEASE OF UDENT INFORMATION

e Family Educational Rights and Privacy Act of 1974 applies to institu- nal policies governing access to and release of student education records intained by educational institutions which are recipients of federal funds. e University complies with this statute, which states, in part, that such insti- ions must:

1. Afford students access to education records directly related to them;
2. Offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. Receive the student's written consent before releasing information from his or her education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and

4. Comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: name, local address; telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is located on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violations of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

Consortium of Universities of the Washington Metropolitan Area, Inc.

The universities in Washington, D.C. (American University, Catholic University of America, George Washington University, Georgetown University, Howard University, and the University of the District of Columbia) are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in Canon Law, Dentistry, Medicine, and Theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all the participating institutions. See pages 205–06 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in room 103, Tompkins Hall. Students register and pay tuition at their own institutions for Consortium courses; course fees are payable to the visited institutions.

Center for Academic and Administrative Computing

The Center for Academic and Administrative Computing is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week, to all faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The Center operates an IBM 3031 (OS/VS1) central processing unit and a PDP 11 minicomputer which provides terminal and card remote-job-entry to the 3031. There is a full range of compilers and application software packages.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

The Speech and Hearing Clinic

The Speech and Hearing Clinic offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech; and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

The Reading Center

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed. Mechanical aids such as the tachistoscope, rate accelerator, and controlled reader are available for increasing speed of comprehension.

Fees.—The fee for full-time George Washington University students and alumni for reading classes (15 two-hour sessions) is $90. Others should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center.

Reading instruction is required for first-year undergraduate students with insufficient reading skills who are taking English 9.

Veterans Benefits

The Veterans Counselor's Office, located on the third floor of Rice Hall, 2121 Eye St., N.W., assists those students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

ROTC

George Washington University students may enroll in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

Alumni Associations

THE GENERAL ALUMNI ASSOCIATION

The objectives of this Association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of the George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Annual Support Program.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

THE ENGINEER ALUMNI ASSOCIATION OF THE GEORGE WASHINGTON UNIVERSITY, INC.

The Association was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to the engineering alumni. The objectives of the Association are to provide the link between the graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 elected members of the Association and the Engineers' representatives serving on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the stu-

dent body. Members of the Association are elected each year, prior to the June meeting, to three-year board memberships as listed below:

Term Expiring 1980	*Term Expiring 1981*	*Term Expiring 1982*
Habib Duranni	John V. Howie	Wesley G. Harris
Jacquelyn Eisenberg	John A. LeReche	Mary O. Jones
Pastor Farinas	Eric S. Mendelsohn	John P. Storms
Harold Sangester	Dudley J. Schwartz	Stuart F. Terrett III
Herbert S. Wilkinson	James A. Sinsabaugh	James Wong

General Alumni Association Representatives
Douglas L. Jones
John R. Manning
Issa Khozeimeh

Student Representative
Lou Schlager

Faculty Representative
Galip M. Arkilic

Regional Director
William H. Holt

At the June meeting each year the board elects officers for its operation during the upcoming year. The officers for the year 1979–80 are:

President—Pastor Farinas, M.E.A. 1972; 5 Bethayres Ct., Rockville, Md. 20855

Vice President—Eric S. Mendelsohn, B.S.C.E. 1967; 7728 Warbler Lane, Derwood, Md. 20855

Secretary—Wesley G. Harris, B.S.C.E. 1962; 8732 Higdon Drive, Vienna, Va. 22180

Treasurer—Dudley J. Schwartz, M.S. 1973; 14132 Flint Rock Road, Rockville, Md. 20853



TUDENT LIFE



he office of the Vice President for Student Affairs develops student life rvices, policies, and procedures to complement the University's formal struction program. These activities are implemented through the offices of e Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educa- onal Opportunity Program, Housing, International Students, Student Activities, udent and Alumni Career Services, and Student Health Service.

udent Services

FFICE OF THE DEAN OF STUDENTS

he Office of the Dean of Students provides counseling and information for udents and assists in program development for the Division of Student Af- rs. Staff members are well-informed on University policies and the various udent services provided on campus, enabling them to provide referrals and swers to many questions concerning general student life. Personal letters of commendation for students applying to graduate and professional schools can obtained from this office. The Dean of Students is responsible for the serv- s and programs offered by the Counseling Center, the Educational Oppor- nity Program, International Student Advising Office, Services for Students th Disabilities, the Student Health Service; and the Student and Alumni areer Services Office.

RVICES FOR STUDENTS WITH DISABILITIES

he Director of Services for Students with Disabilities works to assure that e special services necessary for handicapped students to participate fully in eir academic programs and the extra-curricular life of the campus are pro- ded for them through university or community resources.

OUSING

mplete information concerning the University's residence halls is available om the Director of Housing, George Washington University, Washington, C. 20052. Information concerning off-campus housing near the University o may be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive, with his notification of acceptance, University residence hall information, an application for residence hall space, and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, and lease payment must be made by June 13 for the fall semester.

1980–81 Residence Hall Rates Per Person For Two Semesters*

For Men:

Calhoun Hall	
double room	$1,400
triple room	1,300

For Women:

Strong Hall	
single room	1,524
double room	1,456
triple room	1,356

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—	
double room	1,400
Building JJ (limited to sophomores, juniors and seniors)—	
apartments for 4 to 6 persons	1,460
Francis Scott Key Hall (limited to juniors and seniors):	
apartment for two persons	1,524
apartment for three persons	1,524 or 1,460
Mitchell Hall (limited to sophomores, juniors, and seniors)—	
single room	1,524
Madison Hall	
double room	1,400
triple room	1,300
Thurston Hall	
double room, triple room, room for four	1,400
suite for six, small room for four	1,300

Munson Hall Apartments

Munson Hall is a University-owned and -operated apartment house containing 15 one-bedroom and 54 efficiency apartments. Full-time graduate and married students are eligible to reside in Munson Hall. Those wishing to apply for an apartment should contact the Housing Office for a waiting list application. All leases are for 12 months.

* Residence Hall prices and allocation subject to change.

Hilton and Guthridge Apartments

These apartment houses are University-owned, commercially-operated buildings within the campus area. Each building contains efficiency and one-bedroom units which are rented only to full-time graduate students on an "as available" basis. Referrals to the resident managers of these buildings are made by the Director of Housing when notice is received of vacancies. Leases are executed with the respective management companies and are on a month-to-month basis.

FOOD SERVICE

Resident freshmen and sophomores are required to choose one of the following three food service plans. The seven-day, 19 meals per week plan, at the rate of $1,184* for the academic year; the any 14 meals per week plan at $1,106* for the academic year; or the any 10 meals per week plan at $1,054* for the academic year. Participation in the food service plans is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

EDUCATIONAL OPPORTUNITY PROGRAM

The Educational Opportunity Program is designed to provide selected District of Columbia high school graduates and other qualified District residents with financial and personal support as well as academic assistance to help students pursue undergraduate degree work at George Washington University. The Program office is located at 2127 G Street, N.W.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; by the departments of drama, dance, and music; and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the functioning of the Center by working closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located in the H. B. Burns Memorial Building at 935 22nd St., N.W.

*Food service prices subject to change.

The Health Service is staffed by physicians, nurse practitioners, and physician's assistants who are capable of addressing most of students' medical problems. Visits are cost-free and may be either arranged by appointment or, during certain hours, secured on a walk-in basis. Most routine laboratory tests may be performed in the Health Service lab at cost, many common medications are stocked to fill students' prescriptions, and allergy shots and immunizations are administered by the staff nurse for a minimal charge. A psychiatrist works in the Health Service to assist students with mental health concerns.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students enrolled in the College of General Studies and Continuing Engineering Education Program are not eligible. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should consult the Student Health Service or the Office of the Dean of Students.

COUNSELING CENTER

The Counseling Center, located at 718 21st St., N.W., works to enable students to overcome obstacles which hamper learning. The Center's services are offered to students and staff, and include resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills training: training of graduate students, resident assistants, and paraprofessionals; consulting on mental health topics; and development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing, and special assessments for business and industry. Through its Office of Community Services, the Counseling Center also provides vocational counseling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and 1 to 4:30 p.m. on Fridays. If the student decides to continue, a fee of $5 for full-time students ($15 for part-time students) per appointment will be charged for short-term treatment. If a test battery is called for, an additional $16 materials fee will be charged. However, if financial need is a factor, fee adjustments can be made.

INTERNATIONAL STUDENT ADVISING OFFICE

Located in the International House at 2129 G St., N.W., the staff of the International Student Advising Office provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement assistance to University students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a resource center of literature on occupations and employers, and current information on government employment including testing dates and application forms. Seniors and alumni may also use the Office to establish credential files for application to graduate schools and for employment. The Office is located in Woodhull House, 2033 G St., N.W.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling. Religious services and special observances are also provided for the University community as announced.

DAVIS-HODGKINS HOUSE

The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The House, at 2142 G Street, N.W., provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

Student Activities

The offices of the Vice President for Student Affairs, the Dean of Students, the Director of the Cloyd Heck Marvin Center, and the Director of Student Activities are responsible for all co-curricular phases of student life.

STUDENT ACTIVITIES OFFICE

The Student Activities Office assists individual students and organizations in program development, campus leadership training, and participation in special projects, both within the University community and the community at large. The office serves as a clearinghouse for activities information, registers and advises student organizations, and informs the University community of activities and programs through monthly and annual publications. The Student Activities office is also responsible for coordinating the orientation program for new students, and for planning supplemental development programs for graduate

and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

Additional information about the numerous student organizations and committees is contained in the *Student Handbook*, compiled by and available at the Student Activities Office in the Marvin Center.

STUDENT GOVERNMENT

The George Washington University Student Association is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. The Student Association provides various services for students such as an academic evaluation, a student directory, and the Student Advocate Service. Further information can be obtained from the Student Association offices in the Marvin Center.

Student involvement in the governance of the University is also possible through participation in various administrative and Faculty Senate committees, advisory councils of the schools and colleges, selected committees of the Board of Trustees, and specialized bodies such as the Residence Hall Association, the Joint Food Services Board, and the Marvin Center Governing Board. This involvement has helped develop policies and programs beneficial to students and to the total University community.

THE ENGINEERS' COUNCIL

The Engineers' Council is the student governing body for the School of Engineering and Applied Science, composed of elected representatives from each level class and from the graduate student body, from each student organization in the School, and the House Manager of the Davis-Hodgkins House. The purpose of the Council is to provide liaison between the student body of the School and the Faculty, Administration, and Student Government of the University in all matters affecting the general interests and welfare of the student body, the School, or the University. The Council is maintained financially by the Engineers' Council fee paid by each student in the School, and sponsors the Engineers' Mixers and the Engineers' Ball. Council meetings are open to all students in the School.

STUDENT ORGANIZATIONS

Students are encouraged to become involved with existing student organizations or to initiate their own. There are approximately 160 organizations on campus concerning a broad spectrum of interests including: academic, professional, honorary, international, cultural, political interest, service, special interest, sports, hobbies and recreation, religious and meditative, as well as social fraternities and sororities. More complete information about these organizations can be obtained through the Student Activities Office.

The following is a representative list of organizations active at the University during 1980–81 of particular interest to students in the School of Engineering and Applied Science.

Honor Societies

Sigma Xi—A national scientific honor society, the purpose of which is to encourage original investigation in pure and applied science. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

Delta Sigma Rho-Tau Kappa Alpha—A national forensic society.

Mortar Board—A national society for juniors and seniors, stressing leadership, scholarship, and service.

Omicron Delta Kappa—A national society emphasizing leadership in extracurricular activities.

Phi Eta Sigma—A national society established to encourage and reward high scholarship and attainment, membership in which is limited to those freshmen who attain a scholastic average of at least 3.50 or the equivalent.

Tau Beta Pi—A national engineering honorary fraternity, the purpose of which is to recognize distinguished scholarship and exemplary character.

Eta Kappa Nu (Theta Iota Chapter)—A national electrical engineering honor society established to recognize scholarship, character, and service.

Omega Rho—A national operations research honor society established to recognize outstanding scholarship, character, and service.

International and Cultural Exchange Organizations

East Asian Society, Friends of Canada, International Students' Society, Latin American Association, Libyan Student Organization, Organization of Arab Students, Polish American Youth Club, Students' Cultural Association of India, World Affairs Society.

Performing Arts

GWU Dance Production Groups; Student Productions; University Chamber Choir, Chorus, Orchestra; University Program Board; University Theater. A variety of programs is presented by these groups throughout the academic year.

Political Interest Organizations

GW Ripon Society, GW College Young Republicans, GW Young Democrats, Young Americans for Freedom, Young Socialist Alliance.

Professional Organizations

American Society of Civil Engineers (Student Chapter).

American Society of Mechanical Engineers (Student Chapter).

Institute of Electrical and Electronic Engineers (Student Chapter).

Theta Tau (Gamma Beta Chapter).—A national professional (engineering) fraternity. Membership by invitation to outstanding students who have completed successfully at least the first year in the School of Engineering and Applied Science.

Publications and Communications

The Cherry Tree (yearbook), *G.W. Forum* (student-faculty journal), *Potomac Review* (publication of Consortium graduate students), *The Rock Creek* (liter-

ary magazine), *Student Handbook, This Month* (listing of major cultural events in the Washington area), *Campus Calendar* (biweekly listing of scheduled events), *The University Hatchet* (semi-weekly newspaper), WRGW (University radio station), 676-NEWS (recorded telephone message of daily University activities).

Religious and Meditative Organizations

Baptist Student Union, B'nai B'rith Hillel Foundation, Christian Science Organization, Eastern Orthodox Fellowship, Eckankar Campus Society, Inter-Varsity Christian Fellowship, Lutheran Student Association, Newman Foundation, Psychegenics Club, Religious Society of Friends, Student International Meditation Society, Unitarian-Universalist Club, United Christian Fellowship, Wesley Foundation.

Service Organizations

Circle K, Ecology Action, GW Medical Aid, Project Share, St. Elizabeth's Hospital Project, SERVE, Student Housing Project, Student Volunteer Action Council.

Social Fraternities

Delta Tau Delta, Kappa Sigma, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Kappa Epsilon. The Interfraternity Forum coordinates the interest and concerns of some of the fraternities on campus.

Social Sororities

Delta Gamma, Delta Sigma Theta, Kappa Kappa Gamma, Phi Sigma Sigma. A Panhellenic Council includes representatives of sorority chapters at the University.

Special Interest and Advocate Groups

Black Peoples' Union, Jewish Activist Front, Legal Aid Bureau, Peoples' Union, D.C. Public Interest Research Group (GW Chapter), Student Recruitment Committee.

Sports, Hobbies, Recreational Organizations

Amateur Radio Club, Cheerleaders, Collegiate Bowling Club, Folkdance Club, Hockey Club, Military Collectors, Philubious Eggworte (music).

ATHLETICS, INTRAMURAL SPORTS, AND RECREATION

The Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use, including courts for basketball, volleyball, and badminton; a jogging track; a swimming pool; wrestling, gymnastic, and weight rooms; handball and squash courts; and a sauna and lockers. Based in the Smith Center, the men's and women's athletic departments offer a broad program of intramural and recreational activities designed to accommodate various levels of skill, experience, and interest.

The University is a member of the National Collegiate Athletic Association, e Eastern College Athletic Conference, the Association for Intercollegiate thletics for Women, and the Eastern Association of Intercollegiate Athletics r Women. Its Varsity teams compete against major universities throughout the idwest and Eastern Seaboard in such sports as basketball, baseball, soccer, nnis, golf, wrestling, crew, swimming and diving, squash, badminton, volley-ll, and gymnastics.

AJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally known ists is shown in monthly exhibits in the Dimock Gallery in Lisner Audi-ium and in the art gallery of the Cloyd Heck Marvin Center. With the operation of the Curator of Art, an annual student art exhibit is presented.

Concert Series—The Department of Music presents a series of concerts fea-ing faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal dio performances, experimental events, television appearances, and lecture-monstrations. Students may audition to become company members and have opportunity to choreograph, perform, and gain experience in the technical pects of dance productions.

International Programs—The International Student Society presents an an-l International Dinner in cooperation with foreign embassies and interna-nal restaurants. Other programs include regular forums and speakers on ernational topics.

Orchestra and Chorus Concert Series—The University Orchestra and Chorus two facets of the lively arts available to students either as credit courses or extracurricular activities. The Chorus presents major performances to the iversity community three or four times a year, including regular winter and ing concerts. The University Orchestra presents several performances an-lly.

Program Board—The University Program Board, composed chiefly of cted and appointed students, is given primary responsibility and resources for dent programming on campus. Through its various committees, and in co-eration with other campus groups, it regularly sponsors films, lectures, con-ts, social activities, and special events.

Theater—The University Theater produces four or five major plays and sicals during the year on the proscenium/thrust stage in the Dorothy Betts rvin Theatre or in Lisner Auditorium. Additional works, including original experimental plays, are produced in a more intimate studio theater. Students ve the opportunity to participate in all aspects of theater and may receive dit toward their B.A. or M.F.A. degrees for some of their production work.

THE UNIVERSITY

History and Organization

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is large but intangible.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the Federal City. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "that persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School

located downtown. For the better part of the Columbian University period, buildings of the University were situated along H Street between Thirteenth Fifteenth Streets.

During the last half century the University's present plant has been developed hat section of the old First Ward familiarly known as "Foggy Bottom," be- n Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. area is not without its reminders of historic interest to the University. sident Monroe, who signed the Charter, lived at 2017 Eye Street; the first sident of the Board of Trustees, the Reverend Obadiah B. Brown, was for years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University oped to see established.

he University as it is now organized consists of Columbian College of Arts Sciences (undergraduate); the Graduate School of Arts and Sciences; the fessional schools, which include the National Law Center and the schools Medicine and Health Sciences, Engineering and Applied Science, Education Human Development, Government and Business Administration, and lic and International Affairs; the College of General Studies; the Division University Students; the Division of Experimental Programs; and the Sum- Sessions.

The George Washington University is privately endowed. It is governed by oard of Trustees of which the University president is an *ex officio* member.

e University Libraries

library collections of the University are housed in the University Library general library of the University) and in the libraries of the Institute for -Soviet Studies, the National Law Center, and the School of Medicine and lth Sciences.

hese collections contain approximately 800,000 volumes, to which are ed some 40,000 volumes a year. Endowments supplementing the Univer- appropriation provide books in the fields of American civilization, Ameri- literature, foreign service, history, public finance, and the social sciences; gifts from many sources have enriched the collections. The libraries cur- ly receive about 8,000 serials.

nformation concerning the use of the libraries may be obtained at the library ice desks.

he library is administered for the curricular, reference, and recreational ds and interests of the students. Instruction in the use of the library is given n request by the reference librarians. The library endeavors to assist students all members of the University to use the rich library resources of Wash- on and the unusual opportunities they offer for extensive research. Inter- ary loan arrangements are maintained with other libraries in the city and ughout the United States.

he student has access to the Library of Congress, the Public Library of the rict of Columbia and its branches, and many of the special collections of government departments. Graduate students at George Washington Uni- ty may, upon application, be issued a Consortium library card which per- direct borrowing from the libraries of the other Consortium Institutions.

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FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

General Information	Private, nonsectarian, coeducational founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-Campus Students	8,742 full-time; 8,410 part-time (equivalent to 12,646 full-time students altogether
Geographical Origin of Students	50 states, District of Columbia, 120 countries
Number of Full-time Faculty	1,043 (82% with doctoral degrees)
Number of Part-time Faculty	525 (includes some of the most distinguished men and women in Washington)
Residence Hall Space	2,070
Room and Board	Cost varies from approximately $2,355 to $2,710 for the academic year (see pages 226–27)

Undergraduate majors: Accounting, American Civilization, American Literature, Anthropology, Applied Mathematics, Applied Statistics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archeology and Anthropology, Classical Archeology and Classics, Classical Humanities, Computer Science, Dramatic Art, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, English Literature, Environmental Studies, Fine Arts, French Language and Literature, Geodesy, Geography, Geology, Germanic Languages and Literatures, History, Human Kinetics and Leisure Studies, International Affairs, Journalism, Judaic Studies, Latin American Studies, Liberal Arts, Mathematical Statistics, Mathematics, Mechanical Engineering, Medical Technology, Middle Eastern Studies, Middle School Education, Music, Nursing Anesthesia, Nurse Practitioner Program, Oceanography, Operations Research and Computational Science, Philosophy, Physician's Assistant Program, Physics, Political Science, Premedicine, Psychology, Public Affairs, Radio-Television, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture —in Translation, Secondary Education, Sociology, Spanish American Literature, Spanish Language and Literature, Speech Communication, Speech Pathology and Audiology, Urban Affairs, Zoology.

Study leading to graduate or professional degrees is offered in the Graduate School of Arts and Sciences, the National Law Center, the School of Medicine and Health Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

ANNUAL ISSUES OF THE UNIVERSITY BULLETINS

Requests for the following publications must include your zip code and should be addressed to the office indicated, George Washington University, Washington, D.C. 20052

COLLEGE OF GENERAL STUDIES, Counseling and Student Services, College of General Studies

NATIONAL LAW CENTER, Admissions Office, National Law Center

SCHOOL OF ENGINEERING AND APPLIED SCIENCE, Admissions Office, School of Engineering and Applied Science

UNDERGRADUATE AND GRADUATE PROGRAMS (Arts and Sciences, Education and Human Development, Government and Business Administration, Public and International Affairs), Admissions Office

SCHOOL OF MEDICINE AND HEALTH SCIENCES, Admissions Office, School of Medicine and Health Sciences

SCHEDULE OF CLASSES, FALL (Preregistration Edition), FALL (Revised Edition), and SPRING SEMESTERS, Registrar

SCHEDULE OF CLASSES, SUMMER SESSIONS, Dean of University and Summer Students

THE GEORGE WASHINGTON UNIVERSITY

COLUMBIAN COLLEGE OF ARTS AND SCIENCES, 1821

THE GRADUATE SCHOOL OF ARTS AND SCIENCES, 1893

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES, 1825

THE NATIONAL LAW CENTER, 1865

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE, 1884

THE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT, 1907

THE SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION, 1928

THE SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS, 1928

THE DIVISION OF UNIVERSITY AND SUMMER STUDENTS, 1916/1930

THE COLLEGE OF GENERAL STUDIES, 1950

THE UNIVERSITY HOSPITAL, 1898

THE DIVISION OF EXPERIMENTAL PROGRAMS, 1973

COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart. Sc.), and Bachelor of Science in Geodesy (B.S. in Geod.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

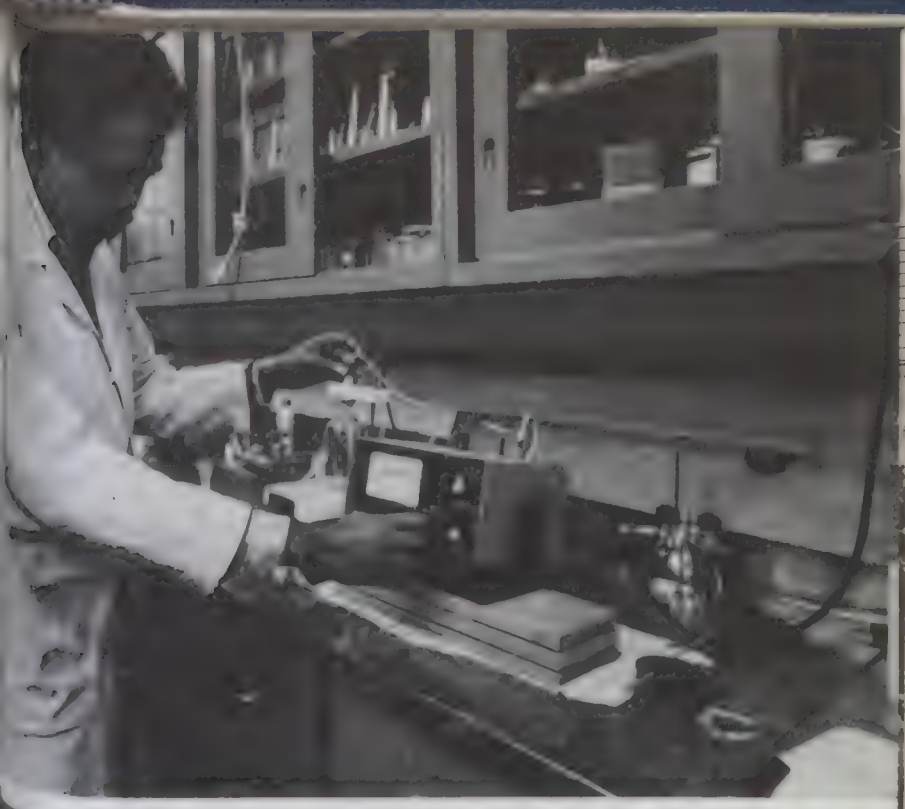
NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. [C.E.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Bachelor of Science (Operations Research and Computational Science) (B.S. [O.R.& C.S.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Doctor of Science (D.Sc.), Engineer (Engr.), and Applied Scientist (App.Sc.)

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT: Bachelor of Arts in Education and Human Development (B.A. in Ed.&H.D.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education and Human Development (M.A. in Ed.&H.D.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

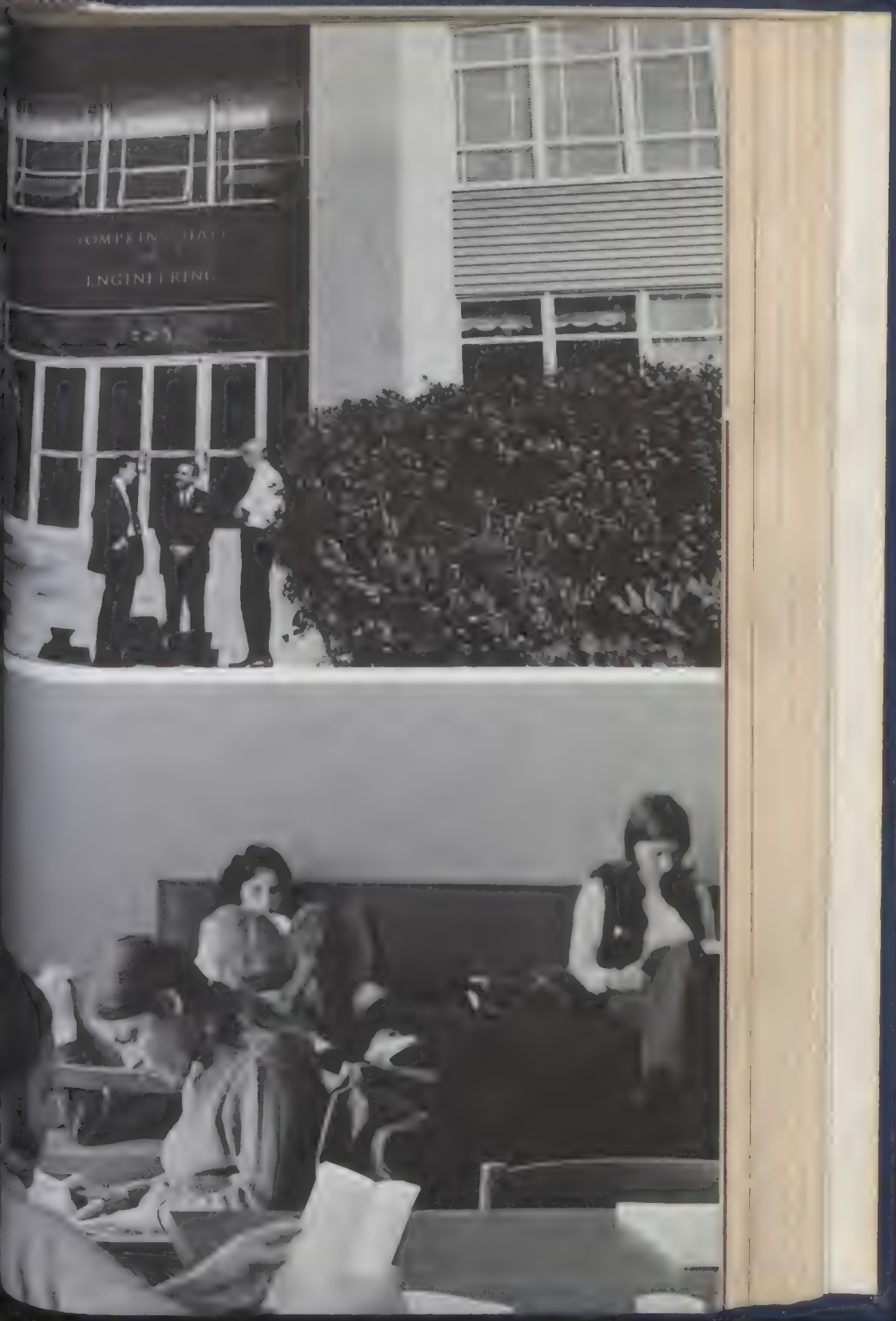
SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Accounting (M.Acct.), Master of Business Administration (M.B.A.), Master of Health Services Administration (M.H.S.A.), Master of Public Administration (M.P.A.), Master of Science in Information Systems Technology (M.S. in I.S.T.), Master of Urban and Regional Planning (M.U.&R.P.), Post-Master's Graduate Certificate in Health Services Administration (Grad.Cert in H.S.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

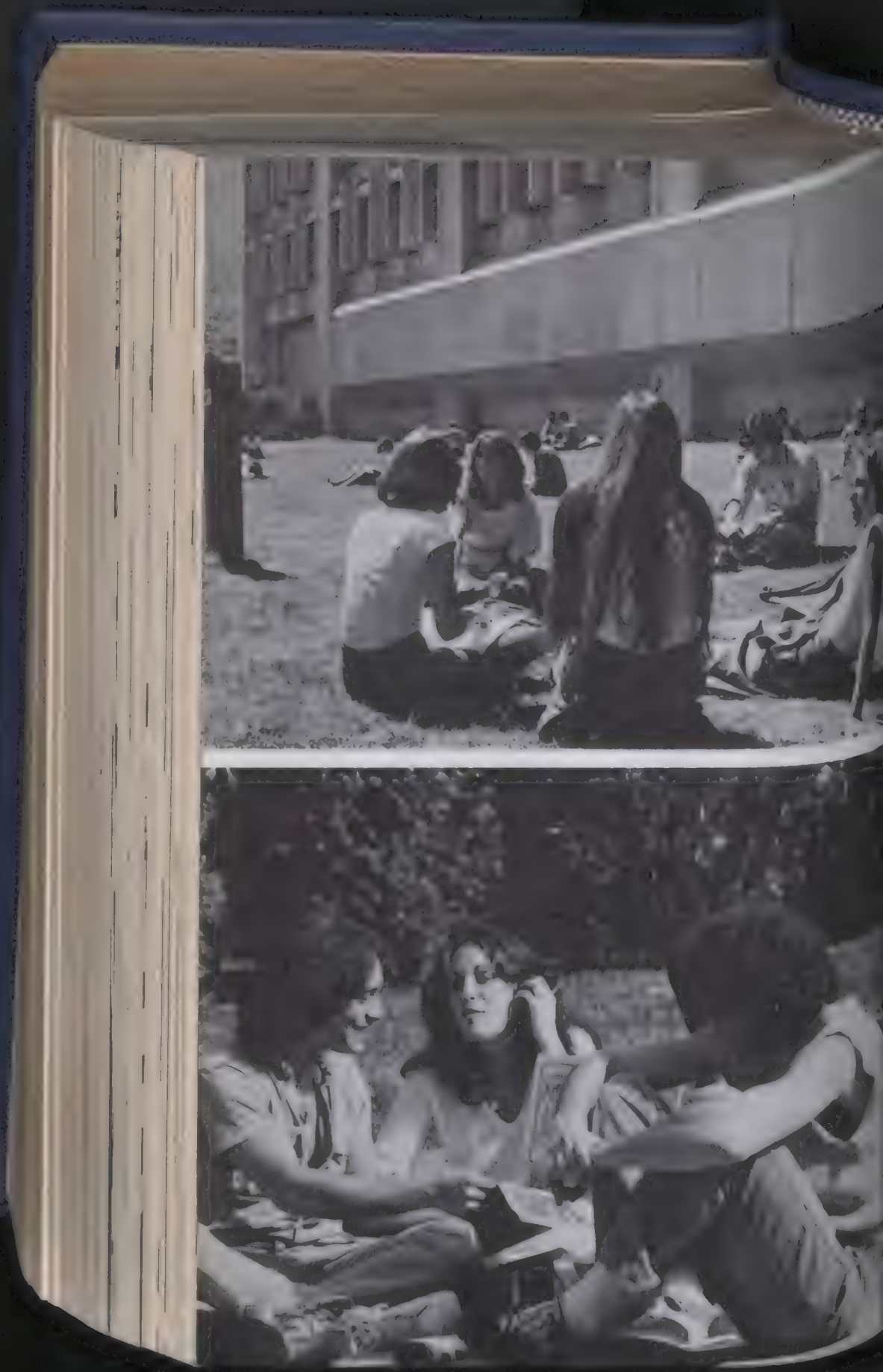
SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.) and Master of Arts (M.A.)

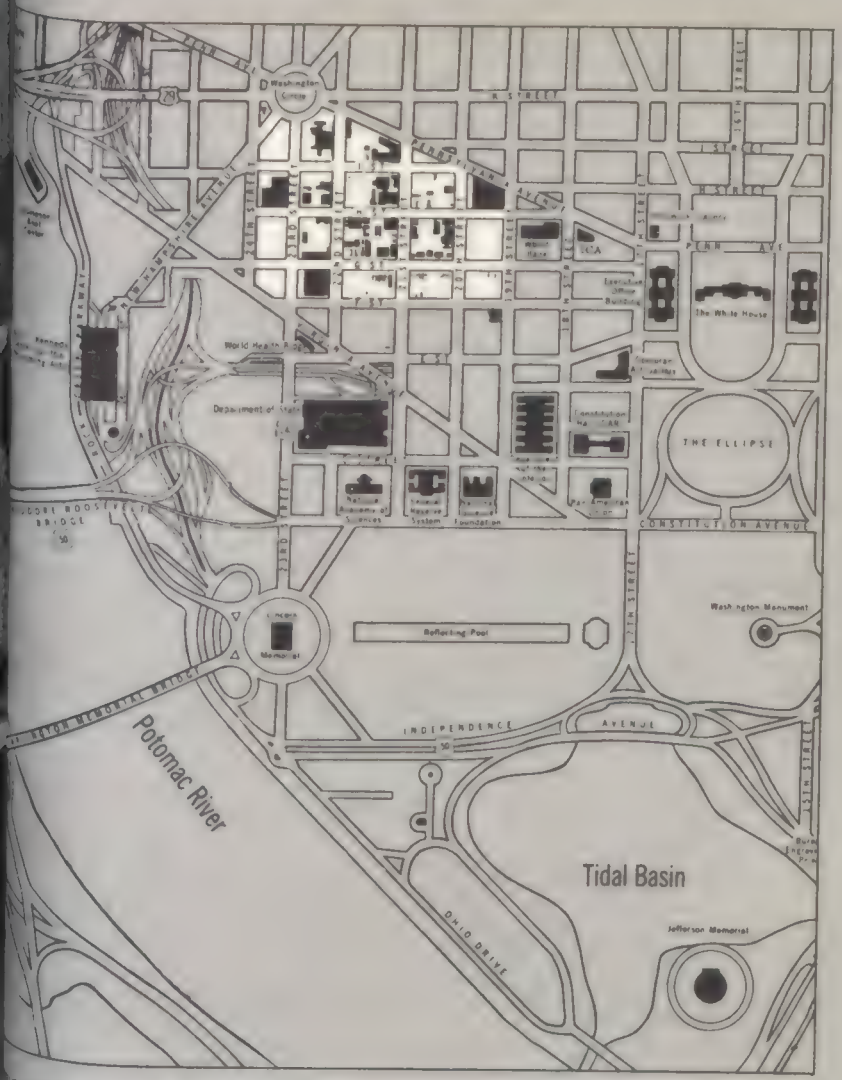







ENGINEERING



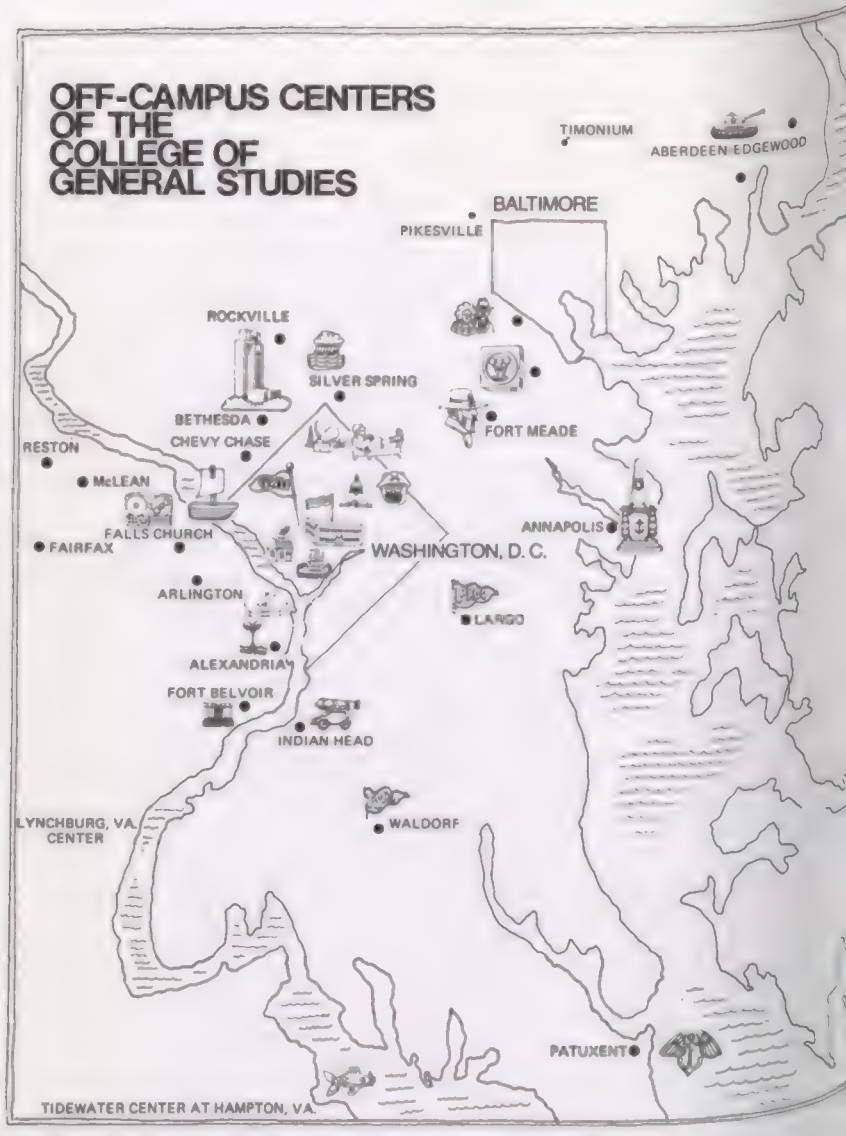


GEORGE WASHINGTON UNIVERSITY CAMPUS / WASHINGTON, D.C.

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GEORGE WASHINGTON UNIVERSITY BULLETIN
e LXXIX, No. 4, July, 1980

EGE OF GENERAL STUDIES
1981



OFF-CAMPUS LOCATIONS OF THE COLLEGE OF GENERAL STUDIES

THE GEORGE WASHINGTON UNIVERSITY BULLETIN
(USPS 343-070)
Volume LXXIX, Number 4, July, 1980

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JULY, AUGUST, AND DECEMBER**

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THE COLLEGE OF GENERAL STUDIES

1980–1981

WASHINGTON, D.C. 20052



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THE CALENDAR 1980–81*

AUGUST 1980

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1980 FALL SEMESTER

August 11–September 2	Off-campus registration†; application for May graduation due as part of registration
August 28–30	Registration on campus† *Thursday-Saturday;* application for February graduation due as part of registration
September 1	Labor Day (holiday) *Monday*
September 2	On-campus classes begin *Tuesday*
September 8	Off-campus classes begin *Monday*
October 13	Columbus Day—no off-campus classes *Monday*
November 7	M.S. in Administration Field Examinations *Friday*
November 11	Veterans Day—no off-campus classes *Tuesday*
November 17	D.Sc. dissertations of February candidates due *Monday*
November 26	Thanksgiving holiday begins after last class *Wednesday*
December 1	Classes resume *Monday*
December 2	Last day of campus classes *Tuesday*
December 6	Ed.S. and M.A. in Ed. Comprehensive Examinations *Saturday*
December 8–17	Campus examination period *Monday–Wednesday*
December 19	Last day of fall semester off-campus classes *Friday*

* Off-campus courses organized at any time. The Academic Calendar is subject to change.

† The registration procedure and the hours of registration will be stated in the *Off-Campus or Campus Schedule of Classes,* which is available well in advance of each semester.

1981 SPRING SEMESTER

January 2	Master's theses of February candidates due *Friday*
January 2–13	Off-campus registration*; application for May graduation due as part of registration
January 8–10	Registration on campus* *Thursday–Saturday;* application for May graduation due as part of registration
January 12	On-campus classes begin *Monday*
January 19	Off-campus classes begin *Monday*
January 20	Inauguration Day (holiday) *Tuesday*
February 16	Winter Convocation (holiday) *Monday*
March 2	D.Sc. dissertations of May candidates due *Monday*
April 10	M.S. in Administration Field Examinations *Friday*
April 13	Master's theses of May candidates due *Monday*
April 17	Last day of spring semester campus classes *Friday*
April 18	Ed.S. and M.A. in Ed. Comprehensive Examinations *Saturday*
April 23–May 2	Campus examination period *Thursday–Saturday*
April 28	Last day of off-campus classes *Tuesday*
May 3	Commencement *Sunday*

1981 SUMMER SESSIONS

There are two seven-week sessions and one fourteen-week session. Days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes.*

*The registration procedure and the hours of registration will be stated in the *Off-Campus* or *On-Campus Schedule of Classes,* which is available well in advance of each semester.

THE UNIVERSITY

HISTORY

GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a National University in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended "a fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President

Monroe, who signed the charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 11 colleges, schools, and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides prelegal and premedical programs, and the preprofessional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Associate in Science in Cartographic Science, Associate in Science in Geodesy, Bachelor of General Studies, Bachelor of Science in Geodesy, and Bachelor of Science in Cartographic Science. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences†‡ offers advanced study and research leading to the degrees of Master of Arts, Master of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs administered by the College of General Studies.

*The School of Medicine and Health Sciences**† offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center‡ offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, and mechanical engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

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* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

‡ The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Human Development and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education and Human Development, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degrees of Master of Arts in Education and Human Development, and Education Specialist are also available through off-campus programs administered by the College of General Studies.

*The School of Government and Business Administration** offers undergraduate programs leading to the degrees of Bachelor of Business Administration and Bachelor of Science in Health Care Administration; graduate programs leading to the degrees of Master of Accounting, Master of Business Administration, Master of Health Services Administration, Master of Public Administration, Master of Science in Information Systems Technology, Master of Urban and Regional Planning; the Post-Master's Graduate Certificate in Health Services Administration, Doctor of Business Administration, and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts.

The College of General Studies supplements the adult education program of the University through campus and off-campus study; conferences, seminars, and special projects; and continuing education and noncredit programs. This College also administers the off-campus programs over which Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, and the School of Government and Business Administration have academic jurisdiction.

The Division of University and Summer Students makes courses available during the regular academic year and the summer to those who are not currently degree candidates at the University.

The Division of Experimental Programs supports University-wide curricular experimentation and development, especially the development of new courses and new programs that entail interdisciplinary or interschool cooperation or that utilize educational resources in the Washington community.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association.

The School of Medicine and Health Sciences is a member of the Association of American Medical Colleges and is one of the medical colleges which has been continuously approved by the American Medical Association.

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* The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

Undergraduate curricula of the School of Engineering and Applied Science in
il, electrical, and mechanical engineering are accredited by the Engineers'
uncil for Professional Development. The School of Education and Human
velopment is a charter member of the American Association of Colleges for
acher Education and is accredited by the National Council for Accreditation
Teacher Education for its bachelor's and master's degree programs. The
hool of Government and Business Administration has maintained full mem-
rship in the Middle Atlantic Association of Colleges of Business Administra-
n since 1961. It joined the Council on Graduate Education for Public Ad-
inistration in 1966. In 1968, the School became a member of the American
sembly of Collegiate Schools of Business, and, in 1977, its undergraduate
ograms were accredited by the Assembly. The programs in accounting satisfy
e educational requirements for the Certified Public Accountant and the Cer-
ied Management Accountant professional examinations. The program in hos-
al administration is accredited by the National Accrediting Commission on
aduate Education for Hospital Administration. The Master of Urban and
gional Planning degree program is recognized by the American Institute of
anners. The Department of Chemistry is on the approved list of the American
emical Society. The Department of Music is an accredited member of the
ational Association of Schools of Music. The graduate program in clinical
ychology in the Department of Psychology is on the approved list of the
nerican Psychological Association. The program in speech-language pathology
d audiology is accredited by the Education and Training Board of the Amer-
an Boards of Examiners in Speech Pathology and Audiology.

NIVERSITY POLICY ON EQUAL OPPORTUNITY

orge Washington University does not discriminate against any person on the
sis of sex, race, color, religion, national origin, or handicap in any of its edu-
tion programs or activities. Federal regulations implementing Title IX of the
ucation Amendments of 1972 and Section 504 of the Rehabilitation Act of
73 call for an explicit statement that the requirement not to discriminate on
basis of sex or handicap extends to employment in and admission to such
ograms and activities. The University is also subject to the District of Colum-
a Human Rights Law.

Inquiries concerning the application of this policy and federal laws and reg-
tions concerning discrimination in education or employment programs and
tivities may be addressed to Marianne Phelps, Assistant Provost for Affirma-
ve Action, Rice Hall, George Washington University, Washington, D.C.
6052, or to the Assistant Secretary for Civil Rights of the Department of
ducation.

OCATION

he University is in downtown Washington, between Pennsylvania Avenue and
9th, F, and 24th Streets, N.W. In immediately adjacent areas are the White
ouse, the World Bank, the Corcoran Gallery of Art, the Department of State,
e National Academy of Sciences, the John F. Kennedy Center for the Per-
rming Arts, and many other governmental and cultural institutions.

THE GENERAL ALUMNI ASSOCIATION

The objectives of this Association are to unite the graduates who wish to ass
ciate themselves for charitable, educational, literary, and scientific purpose
and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the Un
versity and who have left the University in good standing, or any person wh
is or has been a member of the teaching, research, or administrative sta
of the University, or of the Board of Trustees of the University. Active mem
bers are those who are life members of the George Washington University Ge
eral Alumni Association or the Alumni Association of any school of the Un
versity, or are current contributors to the George Washington University Fund

The Office is located in Alumni House, 714 21st Street, N.W., Georg
Washington University, Washington, D.C. 20052.

All alumni are urged to keep the Alumni Office informed of changes of ad
dress or occupation and to supply information with regard to their fellow alumn

THE BOARD OF TRUSTEES

The University is privately endowed and is governed by a Board of Trustee
of which the President of the University is an *ex officio* member.

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Charles T. Manatt, B.S., J.D.
Jeremiah Milbank, B.A., M.B.A.

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* Alumni trustee.

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INTRODUCTION

The College of General Studies, the off-campus division of George Washington University, was established in 1950 to extend the educational resources of the University to the community. The College continues in expanding the University's activities by providing academic programs for adult students and by helping to meet the continuing educational requirements of the National Capital area.

The College offers off-campus credit courses for the nondegree student, for personal enrichment or for updating and upgrading of professional credentials. Off-campus degree programs, administered by the College of General Studies for other colleges and schools of the University, are offered at the undergraduate and graduate level for students who wish to pursue a more formal program of study. Experimental programs of study are developed in cooperation with other colleges and schools of the University in response to specific needs of the government and business community. The College also develops and conducts noncredit courses, seminars, and workshops drawing on the resources of the University.

The staff of instruction for the off-campus programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the Washington professional community.

The College works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study and expand educational opportunities for the mature student. In cooperation with these sponsoring groups the College offers courses at off-campus centers throughout the District of Columbia and in nearby Maryland and Northern Virginia. A center is also located at Hampton, Virginia, serving the Tidewater area. Government agencies and installations, business organizations, or professional groups interested in having the College organize and conduct a course or a comprehensive educational program should contact the Associate Dean of the College of General Studies.

The academic standards of the University are maintained in off-campus credit courses. The College of General Studies is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. All programs offered through the University's off-campus programs administered by the College of General Studies, are approved through the regular University procedure authorized by the Board of Trustees and the Charter granted by the Congress of the United States. Degrees are granted through the faculties of the degree granting schools and colleges of the University. Credit earned through off-campus study conforms to academic standards throughout the University.

DEGREE PROGRAMS

Columbian College of Arts and Sciences offers the following degrees off campus:

Associate in Arts in General Studies
Associate in Science in Cartographic Science
Associate in Science in Geodesy
Bachelor of General Studies
Bachelor of Science in Cartographic Science
Bachelor of Science in Geodesy

The Graduate School of Arts and Sciences offers the following degrees off campus:

Master of Arts in Special Studies
Master of Science in Special Studies

The School of Engineering and Applied Science offers the following degrees off campus:

Master of Engineering Administration
Master of Science
Professional Degrees
Doctor of Science

The School of Education and Human Development offers the following degrees off campus:

Master of Arts in Education and Human Development
Education Specialist
Bachelor of Arts in Education and Human Development

SPECIAL PROGRAMS

SPECIAL CREDIT PROGRAMS

Special credit courses and programs in the liberal arts, education, engineering, and special studies areas can be designed to meet the needs of interested individuals, groups, and agencies. For further information on these programs call 676-7022.

PROGRAMS FOR PROFESSIONAL DEVELOPMENT

Professional development courses, conferences, seminars, and institutes are offered to meet the needs of individuals and groups. They are designed for business, industry, and professional groups. Professional development courses include such topics as: Agricultural Russian, Communication for Managers, Digital Telecommunications, Developmental Mathematics, English as a Foreign Language, Elements of PERT-CPM Techniques, Financial Statement Analysis, Financial Evaluation of Projects and Investment Opportunities, Forensic Crime Scene Technician Program, International Transactions—Commercial and Legal Aspects, Intensive Beginning Russian, Introduction to Electronic Data Processing, Management by Objectives, Management Applications of Behavioral Science, Politics of Management, Radio Spectrum Management, Starting Your Own Business, and Zero Base Budgeting.

For information on professional development programs contact I. Ralph DeBelles, telephone 676-7061; or E. Frank Dulong, Tidewater Center, telephone (804) 838-8444.

For information on Continuing Education for Women Programs, see page 41.

Admission

NONDEGREE STUDENTS

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. A student who has been dismissed or required to withdraw from this or another institution is not eligible to register for at least one fall or one spring semester from the date of such action. Formal University admission is not required for registration.

Nondegree students wishing to enroll in graduate courses other than those offered by the School of Government and Business Administration must have completed a bachelor's degree or have completed 90 semester hours of undergraduate work and they must have the permission of the instructor. Nondegree students who wish to enroll in graduate courses offered by the School of Government and Business Administration must have completed a bachelor's degree.

Credits earned as a nondegree student may later be transferred to degree programs at George Washington University and many other colleges and universities, providing that they are applicable to the desired curriculum, that the student meets the requirements of the degree program for which application is being made, and that all other requirements of the appropriate school are met. The School of Government and Business Administration limits such credit to a maximum of 15 semester hours. A maximum of 45 semester hours earned in nondegree status may be applied toward a bachelor's degree in the other degree-granting colleges or schools of the University. (See page 21 for admission requirements for programs in the School of Engineering and Applied Science.)

ADMISSION AS A DEGREE CANDIDATE

Students wishing to be admitted as candidates for one of the off-campus undergraduate or graduate degree programs of George Washington University may obtain application forms from the College of General Studies, one of the University's off-campus representatives, or the education officer of their agencies or installations. For information on the procedure to be followed when applying for admission to campus degree programs, refer to the appropriate George Washington University bulletin.

An application for admission, required credentials, and a nonrefundable application fee* of $15 (for undergraduate study) or $25 (for graduate study) should be sent to the appropriate office.

Records presented become the property of the University and *cannot* be returned.

Undergraduate Degree Candidacy—Columbian College of Arts and Sciences

Completed application, required credentials, and the application fee should be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

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* The application fee must be by check or postal money order, payable to George Washington University.

The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences, the School of Education and Human Development, and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Secondary school graduates applying for Associate's or Bachelor's degree candidacy must present the combined evidence of (1) an acceptable certificate of graduation from an accredited secondary school, showing a minimum of fifteen units* in a college preparatory or academic curriculum; (2) College Entrance Examination Board scores for both the Scholastic Aptitude Test and the English Composition Achievement Test. The College Entrance Examination Board tests are preferred; however, the American College Testing Battery scores will be accepted, (for students out of high school several years, other appropriate tests may be prescribed). The applicant should request that these scores be sent directly to the Office of Admissions by the Educational Testing Service, Princeton, N.J., or Berkeley, Calif.; or the American College Testing Program, Iowa City, Iowa.

Mature students who do not meet the above requirements may be considered for degree candidacy after the satisfactory completion of at least 15 semester hours of course work with a grade-point average of 2.00 or better. This must include courses in English Composition (Engl 9 or 10 and 11) and 9 semester hours of course work in at least two of the following appropriate areas: humanities (literature, philosophy, foreign languages), social sciences (anthropology, economics, geography, history, political science, psychology, sociology), natural and mathematical sciences.

The selection of qualifying courses should be made in conference with the faculty advisor, and a conference concerning plans for study is required of each applicant for admission to candidacy.

Advanced Standing and Advanced Placement

TRANSFER STUDENTS FROM OTHER COLLEGES AND UNIVERSITIES

Properly certified courses taken at accredited institutions of higher learning may be applied toward a degree, subject to the curriculum requirements of the degree program and the rules of the Columbian College of Arts and Sciences. Although a course completed with a grade of *D* is not acceptable for transfer credit, the course may be used to satisfy a curriculum requirement. Credits completed with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of D or better may not be repeated for the purpose of earning degree credit.

Transfer students whose prior records are not strong enough for admission but who give evidence of potential for successful study, may be given the opportunity to take a trial program. Such students must complete 15 hours of course work in this College with a quality-point index of 2.00 or higher, to be considered for degree candidacy. Courses taken to qualify for candidacy must be distributed over two or more of the following areas: humanities (literature, philosophy, foreign language), social sciences (anthropology, economics, geography, history, political science, sociology), and natural and mathematical sciences. (Students who have not successfully completed an acceptable college course in English Composition must include Engl 9 or 10 and 11.) An applicant who has been suspended for academic reasons from the University must apply for readmission and may not in the interim take course work at the

*A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

University. Credit for any work completed during the semester immediate following suspension here may be assigned only by petition if the stude should later be readmitted to the University.

The University reserves the right to refuse credit for transfer in whole or i part, or to allow it provisionally. Credit so given may be withdrawn for sub sequent poor work.

It is the responsibility of the student to have an official transcript sent directl from each institution formerly attended to the Office of Admissions, Georg Washington University, Washington, D.C. 20052.

CREDIT BY EXAMINATION

In addition to credit allowed in transfer from other accredited colleges or uni versities, a student may earn a maximum of 30 hours of advanced standing, or waive curricular requirements without limitation *(passing a waiver examination does not entitle the student to any semester hours of credit),* by performing satisfactorily on any or any combination of the following:

Advanced Placement Tests (APT).—Administered by the College Entrance Examination Board.

Achievement Tests.—Administered by the College Entrance Examination Board. May be used to waive requirements only.

College-Level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations, with the exception of the English composition and mathematics examinations. To receive credit, examinations must be passed at the 50th percentile or above (1963/1972 college sophomore norms). Credit is assigned, with a few exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy. A candidate for a degree must seek departmental and dean's approval *prior to* taking the examination to receive credit for a CLEP Subject Examination. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board, College-Level Examination Program, Box 1824, Princeton, N.J. 08540.

Special Departmental Examinations in Columbian College of Arts and Sciences.—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If a CLEP Subject Examination is available, the department may choose to employ it.) Approval is not automatically granted; the student must offer evidence of sufficient background to have a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examinations will depend on the department's evaluation of the examination

paper. These examinations will normally be of at least three hours' duration. A $25 fee for each course examination is charged for preparation, administration, and grading of the examination.

Service Schools.—A maximum of 30 (or a maximum of 12 hours if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the *Guide to Evaluation of Educational Experience in the Armed Forces*. Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

Examination for Waiving Curriculum Requirements.—Several departments in Columbian College, including English, history, and sociology, offer periodic waiver examinations for introductory courses. Such examinations may be attempted at the option of the student; a fee of $5 is charged. Specific departments should be consulted for further details. *Passing a waiver examination does not entitle a student to any semester hours of credit.*

United States Armed Forces Institute (USAFI) or Defense Activity for Non-Traditional Education Support (DANTES).—Credit is assigned for A.C.E. approved USAFI or DANTES college-level examinations passed with satisfactory scores.

Undergraduate Degree Candidacy and Advanced Standing—School of Education and Human Development

A completed application, required credentials and the application fee should be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052. Official transcripts are required from each institution attended. Nurses filing for admission to the B.A. program in Human Services are required to submit a copy of their current state nurse's registration (license) in addition to the official transcripts.

Nurses may be awarded advanced standing for work completed in a community or junior college program. Applicants who are graduates of two-year teaching hospital programs are awarded 30 semester hours advanced standing and 45 semester hours for a three-year program. Courses completed with a grade of "D" may not be counted toward advanced standing. However, they may satisfy curriculum requirements. The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

Students applying for transfer from another accredited college or university or from another division of this University whose previous academic records raise doubts of their ability to complete degree requirements successfully may be admitted to the School of Education and Human Development on probation. To be admitted into the School's degree program, a conditionally admitted student must complete a prescribed trial program of 15 semester hours of course work with a quality-point index of 2.25 or higher. A student registered in another division of this University who has an accumulated quality-point index of less than 2.00 and who is conditionally admitted to this School must earn a 2.25 quality-point index in the trial program and must during this trial program bring the accumulated quality-point index to 2.00 or higher to be admitted to the School's degree program.

The selection of courses to be taken in the trial program must be made in conference with a faculty advisor in the School of Education and Human Development. A conference concerning plans for study as a degree candidate

is required of each applicant at the beginning and end of the trial program. Upon successful completion of the trial program, the student who has submitted an application will be advanced to degree status.

LPNs, technicians, and other human services personnel are eligible to file for degree candidacy. For information please contact Louis H. Kornhauser in the Office of the Dean, School of Education and Human Development, 676-6160.

Graduate Degree Candidacy

MASTER'S DEGREES

The Degree of Master of Arts in Education and Human Development (School of Education and Human Development).—Application for Master's degree candidacy may be filed for admission to the fall and spring semesters or the summer sessions. The completed application, required credentials, and the application fee should be sent to the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052.

Admission to study toward a Master of Arts in Education and Human Development degree requires a bachelor's degree from an accredited institution, an undergraduate quality-point index of 2.50 or above (C+ average), demonstrated interest in education or education-related fields, and appropriate undergraduate course work. Students whose quality-point index is in the range of 2.3 to 2.49 will be considered for provisional admission. The quality-point index is computed on the basis of the last two years of the bachelors' degree program and on all course work completed beyond the baccalaureate. Two years of successful teaching are required before admission to candidacy in the field of school administration. Experience may be required for admission to programs in adult education and human resource development.

The Degrees of Master of Arts in Special Studies or *Master of Science in Special Studies (Graduate School of Arts and Sciences).*—These are interdisciplinary Master's degree programs in specific academic areas offered at off-campus locations by the Graduate School of Arts and Sciences. Application for Master's degree candidacy must be made before registration. Completed application, required credentials, and the application fee should be sent to the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

Admission to graduate study toward a Master's degree in this School requires a bachelor's degree, from an accredited college or university, with an over-all quality-point index of 3.00 (a *B* average) or an equivalent grade.

A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the Graduate School from the Division of University and Summer Students, another degree-granting division of this University, or another accredited college or university. See page 97 of the *Undergraduate and Graduate Bulletin* for further restrictions on transfer of credit.

The Degree of Master of Business Administration or *Master of Public Administration (School of Government and Business Administration).*—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Government and Business Administration, George

Washington University, Washington, D.C. 20052. The Application for Graduate Degree Candidacy shows the application deadlines for degrees offered by this school. For further information on these programs, see the *Undergraduate and Graduate Bulletin*.

The Degrees of Master of Science or *Master of Engineering Administration (School of Engineering and Applied Science).*—Application for Master's degree candidacy *must* be made before registration. Completed application, required credentials, and the application fee should be sent to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052.

Admission to graduate study toward a Master's degree requires an appropriate Bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by undergraduate grades, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the Master's degree.

Students wishing to apply for admission to the program of study leading to the degree of Master of Engineering Administration must meet the following additional admission requirements: (1) the applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration;* EAd 160, *Introduction to Engineering Economic Analysis;* and EAd 170, *Basic Quantitative Methods for Engineering Administration.* (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration, and, unless approved by the department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Up to six semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy Master's degree requirements in the School of Engineering and Applied Science. However, the student must, with the approval of the advisor, petition to the appropriate department chairman for such a transfer.

EDUCATION SPECIALIST DEGREE

Consideration for admission to an Education Specialist program in the School of Education and Human Development requires that an applicant have a Mas-

ter of Arts in Education, or the equivalent; two years of pertinent experience in education; and a graduate scholastic average of at least 3.3 or a 50th percentile score on the Graduate Record Examination or the Miller Analogies Test. A score on one of the specified tests must be submitted as part of the admission procedures.

Each applicant must be interviewed and recommended by a faculty advisor in the major field who will submit a tentative program plan prior to admission.

PROFESSIONAL DEGREE

Professional Degree Program (School of Engineering and Applied Science).—Application for Professional degree candidacy, together with nonrefundable application fee, should be sent to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052.

Admission to graduate study toward the Professional degree requires an appropriate Master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

Up to six semester hours of satisfactory credit (with grades of *A* or *B*) beyond a Master's program, which must have been earned in the five years preceding the start of study toward the Professional degree, may be accepted in transfer when applicable to satisfy Professional degree requirements in this School. However, the student must, with the approval of the advisor, petition to the appropriate department chairman for such a transfer.

DOCTOR OF SCIENCE DEGREE

The Degree of Doctor of Science (School of Engineering and Applied Science).—The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

To be admitted to the doctoral program, a satisfactory master's degree from an accredited institution is required, together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards. The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which the Master's degree was received; one of these, if possible, should be from the Master's advisor. The letters should be addressed to the appropriate department chairman.

Up to six semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements of this School, subject to the approval of the student's advisor and his department chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission.

READMISSION

Students previously registered in the University who were not registered during the immediately preceding semester (summer session excluded), must apply for readmission. Students who apply as degree candidates and who were previously registered as non-degree students, or who attended one or more institutions of higher learning during absence from the University, must have complete official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations in effect at the time of readmission.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time last registered at this University and who have not since registered at another institution.

Registration

Off-campus registration is conducted before or at the first class meeting of each course, at times and places stated in the *Off-campus Schedule of Classes*, available well in advance of each semester.

Registration in an off-campus course *constitutes admission to that course only*. It does not admit the student to campus courses or to degree candidacy. Only students admitted to degree candidacy may enroll as full-time students (for 9 semester hours or more). Students taking course work to qualify for degree candidacy who are registered in the College of General Studies may not take more than 10 hours in a semester. Those who have graduated from high school recently and wish to be *full-time freshmen* at this University should apply for admission to the appropriate college or school on campus.

Off-campus degree candidates in an area of concentration with a small enrollment which would not justify offering certain required courses off campus may have to register for campus courses in order to meet the requirements for the degree. See page 29, "Campus Study," for details concerning permission to register for campus courses.

Auditing.—With the permission of the instructor, students may register as auditors. An auditor is not required to take active part or to pass examinations; the auditor receives neither grades nor credit. Tuition is the same for the auditor as for the student registered for credit. With the approval of the dean, a student may change from credit to audit status during the first third of the semester. A student who takes a course as an auditor may not repeat it later for credit.

Concurrent Registration.—Registration in more than one college, school, or division of the University requires the written permission of the deans con-

cerned, *prior to registration.* A College of General Studies Off-campus Concurrent Registration Permit form must be obtained from the appropriate college or school, signed by the dean of that college or school, and presented at the time of registration in the College of General Studies.

Any degree candidate taking course work in another institution or through the Consortium of Universities of the Washington Metropolitan Area, Inc., must have the dean's prior permission.

Fees and Financial Regulations

All fees should be paid by check or money order, made payable to George Washington University. The student identification number should appear in the upper left-hand corner.

The following fees and financial regulations were adopted for the 1980 summer sessions and academic year 1980–81. (See page 26 for projected tuition and fee increases for 1981–84.)

Tuition*

On campus:

Part-time undergraduate program, other than in the School of Engineering and Applied Science, for each semester hour	$125.00
Part-time undergraduate program in the School of Engineering and Applied Science, for each semester hour	137.00
Graduate study, other than in the School of Engineering and Applied Science, for each semester hour	125.00
Graduate study in the School of Engineering and Applied Science, for each semester hour	137.00
Summer Sessions, for each semester hour:	
Other than the School of Engineering and Applied Science	117.00
School of Engineering and Applied Science	129.00

Off campus:

For each semester hour, other than in the School of Engineering and Applied Science	94.00
School of Engineering and Applied Science off-campus programs, for each semester hour†	137.00

‡Thesis:

Master of Arts in Education and Master of Science in Administration degree programs for each semester hour	125.00
School of Engineering and Applied Science programs, for each semester hour†	137.00

* Students interested in full-time undergraduate study on campus should consult the appropriate bulletin (*Undergraduate and Graduate, School of Engineering and Applied Science,* or *School of Medicine and Health Sciences*).

† This fees does not apply to special off-campus programs arranged with the School of Engineering and Applied Science.

‡ Payment of tuition for a master's thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional semester hours may be required in accordance with the regulations of the school in which the student is registered.

University Center Fee (charged only to students registered on campus)

For students registered for 11 or more semester hours on campus:

For each semester 50.50

For students registered for less than 11 semester hours on campus:

For each semester hour for which the student registers 4.75

Energy Surcharge (charged all students registered on campus)

For students registered for 11 or more semester hours:

Each semester 50.00

For students registered for less than 11 semester hours in a semester:

Each semester hour for which the student registers 4.00

Charles E. Smith Center Fee (for off-campus degree candidates only)

Students registered as degree candidates in a program offered through the College of General Studies may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from CGS a signed certificate attesting to degree candidacy 25.00

Special Fees

Application fee (undergraduate degree candidate), nonrefundable 15.00

Application fee (graduate degree candidate), nonrefundable 25.00

Graduation fee, due and payable at the time of registration for the last semester or summer session:

Associate's degree ..... $ 10.00

All other degrees offered by the University 25.00

Late-registration fee, for failure to register for campus courses within the designated period 15.00

Fee for binding two copies of the master's thesis 15.00

Fee for microfilm service and printing announcement of final examination (Doctor of Science candidates) 65.00

Late-payment fee (see Payment of Fees, pages 26–27) 15.00

On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, pages 26–27) 35.00

Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see Payment of Fees, pages 26–27) 15.00

Returned check fee, charged a student whose check is improperly drafted, incomplete, or returned by the bank for any reason 15.00

Special Columbian College of Arts and Sciences departmental examination fee, for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both 25.00

For each waiver examination to qualify for advanced placement 5.00

Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

PROJECTED TUITION AND FEE INCREASES 1981-84

Projected increases for the academic years 1981-82, 1982-83, and 1983-84 have been estimated as follows:

On Campus*

Increase by semester hour (graduate and part-time undergraduate students):

1981–82	$11.00
1982–83	14.00
1983–84	15.00

Off Campus

Increase by semester hour (except School of Engineering and Applied Science programs):

Course Work Other Than Thesis:

1981–82	8.00
1982–83	10.00
1983–84	11.00

†Increase by semester hour in the School of Engineering and Applied Science programs, including thesis:

1981–82	$ 8.00
1982–83	14.00
1983–84	15.00

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

OFF-CAMPUS COURSES

Fees for each semester are due and payable in full at the time of each registration; however, a student registering for a *13-week or longer credit course* may sign a deferred payment contract at each registration to make payments in three equal installments—one-third at the time of registration, one-third by

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* Students interested in full-time undergraduate study on campus should consult the appropriate bulletin *(Undergraduate and Graduate, School of Engineering and Applied Science,* or *School of Medicine and Health Sciences).*

† This increase by semester hour does not include the projected increases for special off-campus programs arranged with the School of Engineering and Applied Science.

October 3, 1980, and one-third by November 3, 1980 (for the fall semester); one third by February 6, 1981, and one-third by March 6, 1981 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance, employee benefits, and partial scholarships must pay their portion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses lasting less than 13 weeks, and for all noncredit courses, are payable in full at registration.

CAMPUS COURSES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made payable to George Washington University with the student identification number in the upper-left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before Wednesday of the eighth week of classes for the fall and spring semesters. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $750.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

ON- AND OFF-CAMPUS LATE PAYMENTS

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35 for on-campus students; $15 for off-campus students.

Returned check—A student whose check is returned unpaid by the bank for any reason will be charged a returned check fee. If the check is not paid

within 15 days, the student will forfeit all rights to check cashing at the University, and future payments for tuition, dormitory, food service, and other special fees will require payment by cash, certified check, or money order.

Students auditing courses are subject to all fees charged to students registered for credit.

REFUND OF FEES FOR OFF-CAMPUS REGISTRATION*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college, school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see "Changes in Program of Studies," page 31).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges will be made in accordance with the following schedule for the academic year:

REFUND SCHEDULE 1980–81

Long Session (or any session longer than 13 weeks)

90% Starting date of class plus 6 calendar days
75% Starting date of class plus 20 calendar days
50% Starting date of class plus 34 calendar days
0% Starting date of class plus 35 calendar days to end

Intermediate Session (9 weeks, 1 day per week)

90% Starting date of class plus 6 calendar days
75% Starting date of class plus 13 calendar days
50% Starting date of class plus 20 calendar days
0% Starting date of class plus 21 calendar days to end

Short Session (7 weeks, 2 days per week)

90% Starting date of class plus 2 calendar days
75% Starting date of class plus 8 calendar days
50% Starting date of class plus 15 calendar days
0% Starting date of class plus 16 calendar days to end

Mini Session (3 weeks)

90% Starting date of class plus 1 calendar day
75% Starting date of class plus 5 calendar days
50% Starting date of class plus 9 calendar days
0% Starting date of class plus 10 calendar days to end

No refund will be awarded for sessions of less than 21 days.

Refund policies of the University are in conformity with guidelines for refunds as adopted by the American Council on Education.

No exceptions will be made for holidays, late registration, absences, or class rescheduling for any reason whatsoever. In no case will tuition be reduced or refunded because of absence from classes.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

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* For regulations concerning refunds of fees for students who register for courses on campus, see the appropriate bulletin *(Undergraduate and Graduate, the School of Engineering and Applied Sciences* or *Summer Sessions)*.

Regulations

AMPUS STUDY

ff-campus degree candidates may register for campus courses approved for eir programs if these courses are not available at off-campus centers. Columan College degree candidates must notify the Office of Student Records, Colge of General Studies, telephone 676-7017, at least two weeks prior to the ate of campus registration. School of Education and Human Development egree candidates should call 676-6160 four weeks in advance of campus gistration and file an application for campus study. Other off-campus degree ndidates should call the appropriate school two weeks in advance as follows: raduate School of Arts and Sciences, 676-6210; School of Government and usiness Administration, 676-6584; and School of Engineering and Applied cience, 676-6158. Registration materials may be picked up by students at uilding K, 817 23rd St., N.W., during registration.

A student may register for on-campus courses as a nondegree student in the ivision of University and Summer Students, telephone 676-6370. An apcation for admission as a nondegree student is required.

TTENDANCE

udents may not attend classes until registration is completed and fees due e paid. They may attend only those classes for which they are registered. egular attendance is expected. Students may be dropped from any course for cdue absence.

CHOLARSHIP

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rades are mailed to students through the Office of the Registrar at the close each semester. They are not given out by instructors.

NDERGRADUATE

he following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; Failure, Unauthorized Withdrawal; *P*, Pass; *NP*, No Pass. Except for rses which specifically state that repetition for credit is permitted, a candie for a degree at this University may not repeat for credit a course in ch a grade of *D* or better was received, unless required to do so by the partment concerned. A written statement to this effect must be submitted to e Registrar by the appropriate department chairman.

RADUATE

he following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum ss; *CR*, Credit; *F*, Fail; *I*, Incomplete; *IP*, Progress; *P*, Pass; *NP*, No Pass.

W, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. Except for courses which specifically state that repetition for credit is permitted, a student taking graduate courses at this University may not repeat for credit a course in which a grade of *C* or above was received. In the Graduate School of Arts and Sciences and the School of Engineering and Applied Science a student may be required to repeat a course for credit by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol *I* (Incomplete), the symbol *W* (Authorized Withdrawal), or the symbol *Z* (Failure because of unauthorized withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, the instructor may initiate an appropriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete from a student's record, consult the regulations of the college, school, or division concerned.

THE QUALITY-POINT INDEX*

Scholarship is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on his or her record in this University. Quality points are computed from a numerical equivalent assigned each grade: *A*, 4 points; *B*, 3 points; *C*, 2 points; *D*, 1 point; *F*, no points. Example: if a student received an *A* in one three-credit course, and a *B* in another three-credit course, he would compute his quality-point index this way:

$A = 4 \times 3$ (semester hours) $= 12$
$B = 3 \times 3$ (semester hours) $= 9$

$6 \qquad 21 \div 6 = 3.5$ quality-point index

Courses marked *CR*, *I*, *IP*, *P*, *NP*, or *W* are not considered in determining the index, except that courses marked *I* will be considered after a formal grade is recorded. With the exception of Consortium courses, grades in courses taken at other institutions are not considered in computing the quality-point index.

* Not applicable to Columbian College or to graduate study in the School of Engineering and Applied Science.

cademic Dishonesty

he University community, in order to fulfill its purposes, must establish and aintain guidelines for academic behavior. Members of the community are pected to exhibit honesty and competence in their academic work.

Incoming students have a special responsibility to acquaint themselves with, d make use of, all proper procedures for doing research, writing papers, and king examinations.

Members of the community will be presumed to be familiar with the proper ademic procedures and held responsible for applying them. Deliberate fail- e to act in accordance with such procedures will be considered academic dis- onesty. Acts of academic dishonesty are a legal, moral, and intellectual of- nse against the community and will be prosecuted through the proper Uni- rsity channels.

Copies of the University policy on academic dishonesty can be obtained from e following officers: all department chairmen, all academic deans, and the ice President for Academic Affairs.

HANGES IN PROGRAM OF STUDIES

OPPING A COURSE OFF CAMPUS

course may be dropped without academic penalty during the first third of e semester (first through third class meeting in the School of Government d Business Administration; first through fourth class meeting in all other chools). Withdrawing from a course without academic penalty after this riod requires approval of a written request, *accompanied by a completed hange slip,* addressed to the Dean of the College of General Studies.

Procedure for Dropping Courses.—An off-campus Change Slip (obtainable rom the instructor or from the College of General Studies) must be completed, d signed by the student and the instructor, and submitted to the College of eneral Studies. The instructor will indicate on the Change Slip whether or not e student is passing. Merely reporting a withdrawal to an instructor does not nstitute official withdrawal from a course. The effective date of withdrawal ll be determined by the appropriate dean. Full refund, if appropriate, will lso be indicated by the dean.

Failure to follow the proper procedure will result in the Office of the Regis- r recording the grade of *Z* and, regardless of the time of discontinuance, will ot relieve the student of financial responsibility for the entire course.

OPPING A COURSE ON CAMPUS

campus Change Slip (available at the Office of the Registrar) must be com- eted and signed by the student, and dated by the instructor. Columbian ollege degree candidates submit theirs to the Office of Counseling and Stu- nt Services, College of General Studies. All other degree candidates sub- t their campus Change Slips to the appropriate dean.

Each college, school, and division of the University sets deadline dates oncerning withdrawal each semester. Withdrawal between these dates and e end of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

TRANSFER WITHIN THE UNIVERSITY

Transfer by degree candidates from a program in one college, school, or division of the University to another may be made only with the approval of the deans concerned. Applications for transfer are available at the University Office of Admissions or appropriate admitting office. Upon transfer the student should consult his or her faculty advisor as to the requirements that must be fulfilled.

A maximum of 42 semester hours is transferable toward the Associate of Arts in General Studies degree; a maximum of 90 semester hours is transferable toward a Bachelor's degree; and a maximum of nine semester hours is transferable toward the degree of Master of Arts in Special Studies, Master of Science in Forensic Science, or Master of Science in Special Studies. Degree candidates transferring within the University are advised to note the residence requirements of the school or college from which the degree is sought.

CREDIT

Credit toward a degree is given only after registration for and satisfactory completion of the required course work, or upon the granting of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

For transfer from credit to audit status, see page 23.

BALANCE SHEET

On request, the Office of the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the dean to inactive status (see below) the student must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of the degree, the student may petition the dean for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

INACTIVE STATUS

Under the regulations established by each school and college a student may be considered in continuous pursuit of the degree while not enrolled in courses at the University when engaged in the following: cooperative engineering-work semester; "year abroad program"; attendance at another institution with prior approval to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received; or non-course instructional activities unique to the particular school or college.

To be enrolled in inactive status a student must request, in advance of the year or semester concerned, and be granted approval for the specific activity desired. This status is generally limited to one year and no fees are assessed students while in this status.

GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which registered; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close for which the degree is to be conferred. A letter concerning degree completion is sent to military files upon request.

Application for Graduation.—An "Application for Graduation" form *must* be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship.—The student must meet the scholarship requirements for the particular degree for which registered.

Curriculum.—Minimum curriculum requirements for each degree are stated under the college or school offering work in preparation for the degree.

Residence.—A student is "in residence" only when registered for course work after filing formal application for degree candidacy or for the 15 semester hours undertaken to qualify for degree candidacy (see the specific residence requirements for the degree concerned).

With the permission of the appropriate dean, a student may be granted leave of absence.

Except for Master's degree candidates in the Graduate School of Arts and Sciences, the School of Education and Human Development, and the School of Engineering and Applied Science, service personnel who receive military transfers when they are within six hours of a degree may, by special arrangements, be permitted to complete their work elsewhere, transfer these credits to the appropriate school or college, and receive a degree from the University. This procedure does not apply to Master's candidates who have been granted six hours of transferred credit or have not completed the required courses.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Thesis or Dissertation.—A thesis or dissertation submitted in partial fulfillment of requirements for a degree must be presented in its final form to the dean of the college or school concerned no later than the date specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation. See the appropriate college or school in this bulletin for regulations governing theses and dissertations.

HONORS

Dean's List.—To be eligible for inclusion on the Dean's List, a student must be a candidate for an undergraduate degree. Course work taken while the application for admission is being processed will be computed in determining eligibility for the Dean's List. In Columbian College of Arts and Sciences degree programs, a student must have received grades of *A* in at least 60 per cent of the last 15 semester hours of work and no grades below *B* during that time period.

With Distinction.—The undergraduate degrees may be conferred "With Distinction," at the discretion of the faculty, if a student meets the specific requirements of the college or school. In Columbian College of Arts and Sciences the student must have received grades of *A* in 60 per cent of the courses taken at this University. In the School of Education and Human Development the student must attain a quality-point index of 3.50 or higher in all course work taken at GW. .

To be eligible a student must have completed at this institution at least one-half of the course work required for the degree.

Special Honors.—Special Honors may be awarded to any member of the graduating class for outstanding achievement in the student's major field upon recommendation of the major department. The student must fulfill all of the following requirements:

1. Candidacy for Special Honors must be approved by the faculty member representing the major department or field not later than the beginning of the senior year.

2. Such other conditions as may be set at the time candidacy is approved must be met.

3. At least one-half of the courses required for the degree must have been completed at GW.

4. The specific requirement of the college or school in which registered, must be fulfilled. In Columbian College of Arts and Sciences the student must have received grades of *A* or *B* in 50 per cent of the courses taken at this institution.

Note: A student may receive the Associate in Arts degree "With Distinction" if the student has taken at this institution at least one-half of the courses required for the degree and has received the grade of *A* in at least 60 per cent of these courses.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students. With respect to off-campus students registered in the College of General Studies, all matters pertaining to grievances, petitions, personal conduct, discipline, and academic dishonesty will be referred to the appropriate dean or department chairman for adjudication or resolution in accordance with established University procedures.

THE LIBRARY

A student registered in the College of General Studies is entitled to the use of the University's Gelman Library. Its stacks are open, and all students are welcome to browse. A permit form for library privileges is issued to each student at registration. A borrower's card may be obtained by presenting the permit form at the circulation desk of the Library.

The loan period for stack books is 14 days. Any book which circulates is subject to recall by the library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open, or may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

UNIVERSITY POLICY ON RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from their education records to persons outside the University, except as provided by the Act and except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: ıame, local address, and telephone number; name and address of next of kin; lates of attendance; school, college, or division of enrollment; field of study; :redit hours earned; degrees earned; honors received; participation in organizaions and activities chartered or otherwise established by the University (in:luding intercollegiate athletics); and height and weight of members of athletic eams. A student who does not wish such directory information released must ile written notice to this effect in the Office of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

Student Services

HONOR SOCIETIES

Alpha Sigma Lambda.—A national honor society for part-time evening college and off-campus undergraduate degree students, the purpose of which is to recognize and encourage scholarship and leadership among undergraduate degree candidates. Membership is limited to students who have been enrolled for four semesters or terms in the College of General Studies and have completed 30 semester hours of work toward a degree with a 3.50 average, or

equivalent. The Alpha Alpha Chapter was established at George Washington University in 1965.

Phi Beta Kappa.—Undergraduate degree candidates in the College of General Studies are eligible for membership in Phi Beta Kappa, a national scholarship honorary society. The society recognizes "outstanding intellectual capacity well employed" in the field of liberal arts and sciences. Senior and junior students who are candidates for the degree of Bachelor of Arts, Bachelor of Science, or Bachelor of General Studies in Columbian College, and who have shown broad cultural interests, distinguished scholarly achievement, high character, general promise, and scholarly ideals may, to a number not exceeding 15 per cent of a class, be elected to membership by the faculty members of the Alpha Chapter of the District of Columbia.

COUNSELING

Students in the off-campus programs may obtain educational counseling and assistance in program planning through the Office of Counseling and Student Services or from University representatives at the various off-campus centers. The Office of Counseling and Student Services coordinates student personnel services, including adult academic counseling, vocational guidance as related to educational programs, and liaison with other University departments and services, as well as providing resource center information on tuition assistance available to students in the College of General Studies programs. Appointments may be made by calling the College of General Studies, telephone 676-7000, or through the Education Director at locations where courses are scheduled. University counselors are also available at all locations during announced registration periods and at scheduled times each month.

UNIVERSITY BOOKSTORE

Textbooks may be ordered by mail from the University Bookstore. Forms for this purpose are available at registration. The hours of the Bookstore will be announced in the *Schedule of Classes*.

The Bookstore is located in the Cloyd Heck Marvin Center, 800 21st Street, N.W., telephone 676-6870.

VETERANS BENEFITS

The veterans counselor, Rice Hall, 3rd floor, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. The Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement assistance to GW students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a resource center of literature on occupations and employers, and current information on government employment including testing dates and application forms. Students and alumni may also use the office to establish credential files for application to graduate schools and for employment. Two vacancy subscriptions are available to those unable to come to the Office: one summarizes Washington area jobs which is mailed weekly, another summarizes positions in education nationwide which is mailed bi-weekly. The office is open from 8:30 a.m. to 6 p.m. Monday through Friday. It is located at Woodhull House, 2033 G St., N.W., telephone 676-6495.

SERVICES FOR STUDENTS WITH DISABILITIES

In order to insure that disabled students may have access to George Washington University's many off-campus classes, all facilities that are accessible by wheelchair have been identified. Should a student find that registration has been completed for one of the few facilities that cannot accommodate a wheelchair at that time, the Director of Counseling and Student Services should be contacted at 676-7000 and arrangements will be made to register the student for a class at a location with adequate facilities.

For students with other types of disabilities, the University will insure that any auxiliary aids necessary for students to profit from their educational experience are available. Students who are having difficulty in securing necessary auxiliary aids, should contact the Director of Counseling and Student Services at 676-7000.

Occasionally teaching methods and curriculums may have to be modified to meet a particular set of circumstances. The faculty have been advised of this requirement and are prepared to meet needs as they are identified. Modification of standards, however, is inappropriate and will not be attempted.

Any disabled student desiring to register for an off-campus course of the George Washington University and needing additional information, should call the Director of Counseling and Student Services at (202) 676-7000.





Continuing Education for Women Center

The Continuing Education for Women Center offers programs which enable participants to prepare for new careers, qualify for job promotion, contribute effectively to community affairs, and enrich their own lives. Descriptive brochures on courses and other Center activities may be obtained by calling 676-7036 or writing to the Continuing Education for Women Center, George Washington University, 2130 H Street, N.W., Suite 621, Washington, D.C. 20052.

The Center services include: (1) group career development courses offered in the day and evening, (2) individual counseling services, (3) special interest courses, (4) career certificate programs, (5) academic advising for those enrolled or entering programs offered by the Center, and (6) programs and workshops especially designed for business and government agencies at locations suited to their needs.

The Continuing Education for Women Center is accredited by the International Association of Counseling Services, Inc., an affiliate of the American Personnel and Guidance Association.

COUNSELING SERVICES

The CEW counseling program focuses on issues critical to life management. The basic counseling course, Developing New Horizons for Women, was introduced in 1964. The more than 5,000 women who have enrolled in this program range in age from 18 to 78 and vary in educational background from those without a high school diploma to those with doctoral degrees. Many have subsequently entered a wide variety of traditional and non-traditional careers, begun or continued educational programs, and contributed significantly to their committees.

CEW organizes additional counseling services as special needs are identified. These help individuals analyze situations, assess needs, and develop interpersonal skills which increase effectiveness in meeting the changes, challenges, and complexities of their lives.

Other group counseling courses offered by the Center are Life Management/Career Development, Family Priorities/Individual Needs, Interpersonal Competency Techniques, Job Search, Self Search, Positive Parenting for Working Parents and Others, and Understanding Mother/Daughter Relationships.

Individual career counseling is arranged by appointment. It includes a battery of tests, independent study, and individual conferences with a professional counselor.

SPECIAL INTEREST SERIES

Selected special interest courses and seminars taught by academically and professionally qualified instructors are offered during the day and evening, both on campus and in suburban locations. Courses include Calligraphy, Conference Planning, Effective Listening and Memory Development, Freelance Writing, Graduate Record Examination Review, Investments: Opportunities of the 1980s, Law School Admission Test Review Course, More Than Just a

Spectator: Drama Study for the Theatergoer, Overcoming Math Anxiety, Time Management: Breaking Away From the Time Trap, Writing and Illustrating Children's Books, and Your Personal Fitness Plan.

Career Certificate Programs

LEGAL ASSISTANT PROGRAM

Approved by the American Bar Association, this program was established in 1972 in cooperation with George Washington University's National Law Center. These graduate-level courses develop students' skills in legal research, writing, and analysis. Students gain an understanding of the basic concepts of substantive, administrative, and procedural law. The certificate program can be completed in one year of evening classes or in one summer on an intensive, full-time basis. Courses offered include Legal Research and Writing, Principles of Substantive Law, Civil Procedure, Administrative Law, Legal Accounting, Evidence, Real Property, Legislative Process, Estate and Trust Administration, Legal Ethics, and Principles of Federal Income Taxation.

PUBLICATION SPECIALIST PROGRAM

The Publication Specialist Program, a comprehensive one-year graduate-level certificate program, offers courses covering the total process of magazine and book publishing. The program provides the practical skills needed to enter or advance in all phases of publishing: graphic design, production, editing, writing, and audio-visual communication.

Courses in the Publication Specialist Program are taught by practicing publishers, editors, designers, typographers, printers, and publication managers, and include lectures, workshops, seminars, and tours. Students work on portfolio pieces that demonstrate their abilities in conceptualizing, designing, planning, and editing. Graduates have been employed in book and magazine publishing, and on the periodical and business publication staff of associations, consulting firms, printers, corporations, and government agencies.

Courses offered include Association Publishing, Audio-Visual Publishing, Book Design and Production, Creative Editing, Fundamentals of Proofreading and Editing, Graphic Tools and Techniques, Intermediate Editing and Writing, Magazine Design and Production, The Magazine Editor, Printing and the Graphic Arts I, Printing and the Graphic Arts II, Publication Design, and Publishing Finance and Accounting.

LANDSCAPE ARCHITECT ASSISTANT PROGRAM

Students in this program develop the drawing and design skills essential to entering the environmental design field. Drafting, sketching, organization of space, visual planning, and study of materials are emphasized throughout this one-year certificate program. Instructors are professional landscape architects and horticulturists. Field trips and guest lectures provide exposure to the range of related work in progress in the Washington area. Students explore the design requirements of complex residential, urban, and park sites.

Graduates find employment opportunities with landscape architects, contracting firms, nurseries, public agencies, or as private consultants.

Courses offered include: Drafting and Design I and II, Park and Recreation Planning, Urban Site Design, and Plant Materials, I, II, III and IV.

FUND RAISING ADMINISTRATOR PROGRAM

This program was initiated in response to the increasing need for highly specialized personnel who sustain the programs of nonprofit organizations. The comprehensive course of study is designed to provide the practical skills needed to enter or advance in a career in fund raising, development, and grantsmanship. Course work covers needs evaluation, donor research, proposal design, volunteer recruitment and supervision, and promotional and public relations efforts. Courses offered include The Comprehensive Development Program; Foundations: History, Philosophy, and Regulation; Marketing the Nonprofit Organization; Producing Successful Fund Raising Literature; Grantsmanship; and Careers in Fund-Raising.

ADMINISTRATIVE MANAGEMENT PROGRAM

The Administrative Management Program is designed for management and supervisory level professionals who wish to increase their personal and organizational effectiveness by developing their confidence and improving management skills, techniques, and knowledge. Nine 8-week courses provide participants with an understanding of management theory, functions, and techniques, effective written and oral communication, financial planning and control, marketing, data processing, organizational relationships, personnel policies and procedures, and business law. An Administrative Management Program certificate will be awarded upon successful completion of this one-year graduate-level, evening program. Courses offered include Management Theories, Functions, and Techniques; Data Processing for Managers; Improving Administrative Writing; Effective Oral Communication; and Financial Planning and Control.

ON-SITE COURSES AND WORKSHOPS

Business organizations, associations, and government agencies in the Washington area have been involved in CEW on-site courses, workshops, and programs for the last five years.

These programs are tailored to fulfill specific training objectives of an individual business or government agency. They vary in length from half-day programs to several full-semester courses.

A list of available on-site courses and workshops includes: Management Development, Testing and Evaluation, Interpersonal Skills, Conference Planning, Coping with Conflict, Retirement Planning, Career Development/Life Management, The Woman Manager, Women and Power, Interviewing Techniques, Time Management, Decision-Making, Moving into Management, Supervisory Skills, Stress Management, Positive Communication, Management Skills for Secretaries, Platform Skills, Overcoming Math Anxiety.

Columbian College of Arts and Sciences

The faculty of Columbian College of Arts and Sciences has academic juri diction over the degree of Associate in Arts in General Studies; Associa in Science in Cartographic Science; Associate in Science in Geodesy; Bachel of General Studies with areas of concentration in economics, history, math matics, political science, psychology, and sociology; Bachelor of Science Cartographic Science; and Bachelor of Science in Geodesy. These off-campu programs are administered by the College of General Studies.

ADMISSION

For detailed information see "Admission as a Degree Candidate," page 16.

SCHOLARSHIP REQUIREMENTS

ACADEMIC WORKLOAD

A full-time student in Columbian College of Arts and Sciences who is no on probation ordinarily may not take more than 17 semester hours. A stu dent employed more than 20 hours a week who is not on probation may no take more than 10 hours.

A full-time degree candidate in Columbian College of Arts and Science who, during the immediately preceding semester, has received no grade below *B* and has earned grades of *A* in three courses totaling at least nin semester hours may take 18 or 19 hours. An employed student who, durin the immediately preceding semester, has received no grades below *B* and ha earned grades of *A* in two courses totaling at least six semester hours ma take 12 hours.

A student on probation normally may not take more than three semeste hours.

A student who accepts employment after registration or at any time durin a semester must report that fact immediately to the dean so that the academi program may be adjusted, if necessary.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized With drawal) may be assigned are described on page 30.

Removing an Incomplete.—In Columbian College of Arts and Sciences the grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not re moved within this period is automatically changed to an *F*. In cases of well documented extenuating circumstances, an instructor and a student may jointly petition the Dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

ROBATION

student who in one semester receives two grades of *F* in courses carrying ree or more semester hours of credit each, or the equivalent, is placed on robation. A student in the first semester on probation who receives one grade f *F* in such a course will be considered on probation for a second semester. wo grades of *D* will be treated as equivalent to one grade of *F* in determining robation. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed. student on probation taking 12 or more semester hours whose grades are all or better is removed from probation.

SPENSION

he following cases constitute grounds for suspension: (1) three grades of in courses carrying three or more semester hours of credit, or the equivent, in one semester; (2) two grades of *F* in such courses in the first mester on probation; (3) one grade of *F* in such courses in any later mester on probation. Two grades of *D* will be treated as equivalent to one rade of *F* in determining suspension. Any grades of *D* or *F* replacing earlier rades of *I* will be considered a part of the record for the semester during hich the *I* is removed.

The minimum period of academic suspension is one fall or one spring mester. Final dates for applying for readmission are the same as those overning undergraduate admission. A suspended student seeking readmission ust submit evidence to the Committee on Admission and Advanced Standing conduct during absence from the University which indicates that the student ill profit from readmission. A student suspended twice for poor scholarship ill not be readmitted.

ARNINGS

t stated intervals during the academic year, students who are doing work of *D* rade or lower in courses with departmental numbers below 100 receive arnings." A "warning" constitutes notice to the student that he or she must onsult the instructor and the advisor at the earliest opportunity. "Warning eriods" are established during the seventh and eighth weeks of 13-week ourses, and during the third and fourth weeks of six and a half week courses.

E OF CORRECT ENGLISH

ny student whose written or spoken English in any course is unsatisfactory ay be reported by the instructor to the appropriate dean and to the Comittee on the Use of Correct English. The chairman of the committee may ssign supplementary work, without academic credit, varying in amount with e needs of the student. If the work prescribed is equivalent to a course, the gular tuition fee is charged. The granting of a degree may be delayed by ilure to make up such deficiency in English to the satisfaction of the comittee and the dean.

The rules governing probation and suspension are applicable as stated to students enrolled for a ll-time program (12 semester hours or more) during the fall or spring semester. Students enrolled r less than 12 semester hours during the fall or spring semester and students enrolled during the mmer sessions are subject to probation or suspension on the basis of their record for 12 semesr hours, or multiples thereof, rather than on their record in any one semester.

REQUIREMENTS FOR THE ASSOCIATE'S DEGREES

RESIDENCE

The last 15 semester hours must be completed in residence as a candidate for the Associate's degrees. A portion of the academic work taken to qualify for degree candidacy (see page 16) may be accepted in partial satisfaction of the residence requirement, if the courses are approved as part of the student's degree program.

REQUIREMENTS FOR THE BACHELOR'S DEGREES

RESIDENCE

A minimum of 30 semester hours, including at least 12 hours in the area of concentration, must be completed in residence as a candidate for the degree sought. Unless special permission is granted by the appropriate dean to pursue work elsewhere, *the work of the senior year must be completed in residence.* This requirement applies to students transferring within the University as well as to students transferring from other institutions. The 15 hours taken in order to be considered for degree candidacy may be counted in residence. For regulations governing military students who are transferred when they are within six semester hours of their degrees, see page 34.

PROFESSIONAL COURSES

No more than 12 hours of professional courses, e.g., courses offered in units of the University other than Columbian College, may be included in the hours required for the bachelor's degrees in Columbian College. Students electing professional courses under this rule must obtain the approval of the dean before registration.

ASSOCIATE IN ARTS IN GENERAL STUDIES

Faculty Advisor: Sandra C. Garcia, College of General Studies; Building F, Room 104, Telephone 676-7016.

Upon the satisfactory completion of the requirements set by Columbian College of Arts and Sciences, the degree of Associate in Arts in General Studies is conferred. Students who plan to continue working toward an off-campus bachelor's degree offered by Columbian College must apply to the dean upon completion of the requirements for the degree of Associate in Arts in General Studies. Forms for this purpose are available at the College of General Studies.

After completing the degree requirements, students may wish to transfer to an on-campus degree program within the University, or they may wish to transfer to another institution. However, modifications in admission, advanced standing, and curriculum requirements permitted in the Associate in Arts in General Studies degree program may not be accepted in transfer. Therefore, while registered for this degree, students should meet the requirements of the college, school, or university to which they may wish to transfer. The entrance requirements of the colleges and schools of the University are stated in this catalogue and in the *Undergraduate and Graduate Bulletin* of the University.

Scholarship.—The system of grading is described on pages 29–30. For regulations concerning probation, suspension, and readmission, see page 45.

rriculum

e satisfactory completion of 60 semester hours of college work in the fol-ing curriculum is required. Students who plan to pursue a bachelor's de-ee are advised to plan their Associate's program so that they will have satis-d prerequisites toward a bachelor's degree of their choice.

	Semester Hours
MMUNICATIONS	
Engl 9 or 10, 11	6
SpDr 1, 11, 111, or 121	3
UMANITIES	
Nine semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; Mus 3, 4; Phil 50; Rel 9, 10, 59, 60	9
ATURAL AND MATHEMATICAL SCIENCES	
Three courses selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, 3, 4; Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Ocea 101, 102, 103–4; Phys 1, 2, 3, 4, 9–10; Stat 51, 53, 101–2	9–12
OCIAL SCIENCES	
Nine semester hours are required, each course chosen from one of two departments, selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40, 71–72; PSc 1 or 3, 2; Psyc 1, 8, 22, 29; Soc 1, 2	9
LECTIVE	21–24
Total	60

ACHELOR OF GENERAL STUDIES

aculty Advisor: Sandra C. Garcia, College of General Studies; Building F, Room A, Telephone 676-7016.

e Bachelor of General Studies curriculum aims to provide the adult part-time udent with the opportunity to obtain a broad education. For that reason the ourse work required in the first and second years is distributed among com-unications (written and oral), the humanities, natural and mathematical sci-nces, and the social sciences. In choosing the third- and fourth-year course ork required in departments related to their concentration, students should tain counseling through the faculty advisor.

Students planning to work toward master's degrees are advised to plan their achelor's programs so that they will meet the prerequisite requirements of the chool or college of their choice. Students planning to enter graduate programs hich require a reading knowledge of a foreign language are advised to include o years of a foreign language in their bachelor's program.

Scholarship.—To qualify for graduation, 120 hours of course work must be assed and an index achieved of 2.00 based on courses graded on a four-point ale. At least 60 hours of course work, including the general course require-ents, must be taken outside the major department or program.

The index is obtained by dividing the number of quality points by the num-er of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. Both the umber of quality points and the number of semester hours of courses are based

on the student's record at this University. The index is computed from a numerical equivalent assigned each grade: *A*, four points; *B*, three points; *C*, two points; *D*, one point, for each semester hour for which the student has registered. Courses marked *F*, *W*, *Z*, *I*, *IP*, *P*, or *NP* are not considered in determining the index, though courses passed with *P* count toward the 120-hour overall requirement. (When a formal grade is recorded for an Incomplete, a grade of *D* or better will be included in the computation of the index.) A grade of Incomplete which is not removed within one semester is automatically changed to an *F*. Grades in courses taken at another institution are not considered in computing the index.

Students must also achieve no lower than the grade of *C* in required courses in the selected area of concentration. A *D* in a required course will satisfy a curricular requirement in the area of concentration and may count toward the total 120 hours, but it shall *not* count toward the minimum number of hours required in the area of concentration.

The system of grading is described on pages 29–30. For regulations concerning probation, suspension, and readmission, see page 45.

First and Second Years

	Semester Hours
COMMUNICATIONS	
Engl 9 or 10, 11	6
Engl 20	3
SpDr 1, 11, 111, or 121	3
HUMANITIES*	
Twelve semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; 2 years of one foreign language; Mus 3 and 4; Phil 50; Rel 9 and 10, 59, 60; Slav 91–92	12
NATURAL AND MATHEMATICAL SCIENCES	
Six to eight semester hours selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, or 3 and 4; Ocea 101, 102, 103–4; Phys 1 and 2, or 3 and 4, or 9–10	6–8
Six to eight semester hours selected from the following: Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Stat 51, 53, 101–2	6–8
SOCIAL SCIENCES	
Twelve semester hours selected from two of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 1 and 2; Hist 39–40, 71–72; PSc 1 and 2, 2 and 3; Psyc 1 and 8, 1 and 22, 1 and 29; Soc 1 and 2	12
ELECTIVES (depending on science option)	8–12
	60

Third and Fourth Years

Concentrations are offered in economics, history, mathematics, political science, psychology, and sociology.

* Students who plan to continue study for advanced degrees are urged to fulfill the 2-year language option.

CONCENTRATION REQUIREMENTS (to be selected in consultation with the faculty advisor):

100-level courses in the department of the selected area of concentration....	24*
Courses in two or more related departments.....	18*
ELECTIVES	18
Total	120

Associate in Science in Cartographic Science

Associate in Science in Geodesy

Bachelor of Science in Cartographic Science

Bachelor of Science in Geodesy

Faculty Advisor: Hyman Orlin, Professorial Lecturer in Cartography and Geodesy; Telephone 946-3557. Counseling by appointment only, Telephone 676-7000.

The course work in these two- and four-year curricula is offered both on and off campus. However, the cartography and geodesy courses are given only at selected off-campus locations. Students are advised to be sure they meet all prerequisites and register for courses in the prescribed sequence. Below is a listing of off-campus locations, the distance from campus, and method of available transportation. Students attending these classes are expected to make their own arrangements for transportation. (Many students arrange private transportation on the first night of class.)

Facility	Distance in miles	Method of Transportation
NOAA-Gramax Building, 8060 13th Street, Silver Spring, Md.	9	Public
NOAA-Page Building, 2001 Wisconsin Avenue, N.W., Washington, D.C.	2	Public
NOAA-NBOC-2, 5640 Nicholson Lane, Rockville, Md., telephone 443-8626 for room assignments (Wisconsin Ave., Rt. 240)	20	Public
USMA-TOPO Command, 6101 MacArthur Blvd., N.W., Washington, D.C.	7	Public
U.S. Geological Survey, Reston, Va.	20	Private

Entrance requirements are stated on pages 16–20; residence requirements are stated on page 46.

The system of grading is described on pages 29–30. For regulations regarding probation, suspension, and readmission, see page 45.

The Associate in Science degree may be granted to a student who has completed 60 semester hours in courses listed under either the cartography or

*Students selecting Psychology or Sociology as an area of concentration are required to take 18 semester hours of 100-level courses in their major department. In both areas students must also take 24 semester hours of courses in two or more related departments.

geodesy option. The Bachelor of Science degree may be granted to a student who has completed 120 hours in courses listed under either cartography or geodesy.

General Requirements

All candidates for the degree of Bachelor of Science will pursue a general arts and sciences curriculum until they begin work in their major field. Except for two general course requirements, all curriculum requirements leading to these degrees are established by the major field program.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in the field of English Composition, either by examination or by taking English 9 or 10 and English 11 or 12. This requirement may not be postponed.

2. Each student, at some point in the college career, must undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As each major field will represent one of these three areas, the requirement may be fulfilled by taking no less than six semester hours in each of the other two areas. These six credits may be in approved introductory courses, or in approved advanced courses if the student is qualified and receives the instructor's permission. Courses simply waived (no credit assigned) cannot satisfy the meaningful initiation requirements. Departments and programs are listed below under the three categories.

HUMANITIES	NATURAL AND MATHEMATICAL SCIENCES	SOCIAL SCIENCES
Art	Biological Sciences	American Civilization
*East Asian Languages and Literatures	Cartography	Anthropology
English	Chemistry	Economics
*Germanic Languages and Literatures	Geodesy	Geography and Regional Science
Music	Geology	History
Philosophy	Mathematics	Journalism
Religion	Oceanography	Political Science
*Romance Languages and Literatures	Physics	Psychology
*Slavic Languages and Literatures	Statistics	Sociology
Speech and Drama		

ASSOCIATE IN SCIENCE IN CARTOGRAPHIC SCIENCE

The following requirements must be fulfilled:

1. The general requirements in English.
2. Prerequisite: Cart 1, 2.
3. Required courses in related areas — (a) Math 31, 32; (b) Geod 12, 17, 106; (c) At least two courses from Geology, Physics, Chemistry, or Oceanography.

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* Basic language courses (normally the first two years) are considered "tool studies" and are not acceptable in fulfillment of "meaningful initiation" in the humanities.

4. Required courses in the major — Cart 102, 104, 111, 115, 116, and 125 or 126. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Cart 107, 120, 121, 131; Geod 110, 117, 119, 150, 151.

ASSOCIATE IN SCIENCE IN GEODESY

The following requirements must be fulfilled:

1. The general requirements in English.
2. Prerequisite: Geod 17.
3. Required courses in related areas — (a) Math 31, 32, 33, 124; (b) Phys 1 or 3; (c) Cart 107.
4. Required courses in the major — Geod 106, 110, 150, 160, and at least one course from Geod 117 or 119, 151, 156, 161, 165–66. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Math 139, 153, 157*; Phys 161*; Stat 157–58*; Ocea 101, 105, 110; Geol 1 or 3 or 21*.

BACHELOR OF SCIENCE IN CARTOGRAPHIC SCIENCE

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite: Cart 1, 2.
3. Required courses in related areas—(a) Math 31, 32, 33; (b) Geod 12, 13, 17, 18, 106, 110; (c) At least four courses from Geol 1 or 3 or 21*, Phys 1 or 3, 14*, 15*, Chem 11–12, Ocea 101–102 or 103–104.
4. Required courses in the major — Cart 102, 104, 107, 108, 111, 115, 116, 120, 121, 125 or 126, 131. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Geod 117, 119, 150, 156; Cart 113, 128, 135; Phys 11–12*; Ocea 11, 105; Math 124, 153.

BACHELOR OF SCIENCE IN GEODESY

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite: Geod 17, 18.
3. Required courses in related areas — (a) Phys 1 or 3 and 15*; (b) Math 31, 32, 33, 124; (c) Cart 107; (d) Geol 1 or 3 or 21*; (e) Ocea 101–2 or 103–4, 105.

*Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

4. Required courses in the major — Geod 106, 110, 150, 151, 160, 161, and at least 4 courses from Geod 117, 119, 156, 158, 165–66. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Math 113*, 139, 140, 141*, 142*, 153, 157*; Ocea 110; Phys 161*, 162*; Stat 106*, 110*, 114*, 157–58*.
6. Students considering graduate studies should acquire a reading knowledge of either French, German, or Russian.

SPECIAL DEGREE PROGRAMS

Servicemen's Opportunity College (SOC)

George Washington University has been designated a Servicemen's Opportunity College (SOC). SOC provides opportunities for active duty servicemen and women to pursue educational program goals through courses offered on base, in the evenings, on weekends, and at other nontraditional times. In support of the concept, George Washington University, while still maintaining its normal academic standards, assumes the responsibilities of meeting the educational needs of an individual serving in the Armed Forces. Provisions have been established whereby these individual needs can be met. Specifically, individuals who apply for admission as degree candidates for either the Associate's or Bachelor's degree from George Washington University's Columbian College of Arts and Sciences may, at their request, be designated as SOC students. Such students will be assured of a degree completion program through use of the agreement that follows:

AGREEMENT

George Washington University, a Servicemen's Opportunity College, agrees to the following:

I. Upon admission to Associate in Arts in General Studies or Bachelor of General Studies degree candidacy, the student may take the required course work either on or off campus. Regardless of where taken, courses of study taken while a degree candidate may be applied toward the degree sought, as a requirement or an approved elective. Although the grade of *D* is not acceptable for transfer, it may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for the degree, and it should not be repeated. Courses will be taken from George Washington University unless the serviceman is transferred to a location not served by this University. In the case of transfer and in consideration of the student's future assignment, arrangements will be made between the student and the assigned counselor by the College of General Studies to ensure that the courses taken elsewhere satisfy the George Washington University program.

II. Academic credit may be obtained by any one or a combination of the following:

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* Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

A. Registration as an on- or off-campus, full- or part-time student at this University.

B. Advanced standing for academic studies taken at other accredited institutions where such studies meet the requirements for the degree, or by examination. (A maximum of 42 semester hours allowed for the associate's degree; maximum of 90 semester hours allowed for the bachelor's degree.)

Within the maximum of 42 hours of credit allowed for advanced standing toward the Associate in Arts in General Studies degree, a maximum of 30 hours may be obtained by any one or combination of the methods below. Within the maximum of 90 hours of credit allowed for advanced standing toward the Bachelor of General Studies degree, a maximum of 60 hours may be obtained by any one or combination of the methods below.

1. *College-Level Examination Program (CLEP) Subject Examinations.*—CLEP Subject Examinations are offered in more than 20 subject areas. These tests measure achievement in the equivalent of specific college-level courses. Credit may not be earned by passing the examination after having taken the equivalent course.) Maximum credit allowed for Associate's degree, 30 semester hours; maximum allowed for Bachelor's degree, 60 semester hours. A candidate for a degree from any school at this University must seek departmental approval *prior* to taking the examination in order to receive credit for a CLEP subject Examination. (Credit—advanced standing—is not given for the college algebra-calculus, and college algebra-trigonometry subject examinations.)

2. *College-Level Examination (CLEP) General Examinations.*—CLEP General Examinations are offered in five areas: mathematics; social sciences; humanities; natural sciences; and English composition. (Credit—advanced standing—is not given for the General Tests in English composition and mathematics.) Maximum credit allowed, 18 semester hours.

3. *Columbian College of Arts and Sciences Special Departmental Examinations.*—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If an appropriate CLEP Subject Examination is available, the department may choose to employ it.) The student who performs satisfactorily may receive credit (advanced standing), waiver of requirement, or both, at the discretion of the department. (A student who has previously taken examinations to waive course requirements may not, however, at a later time take examinations for credit in the same courses.) Special departmental examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparing, administering, and grading. Maximum credit allowed for Associate's degree, 30 semester hours; maximum allowed for Bachelor's degree, 60 semester hours.

4. *Service Schools.*—A maximum of 30 (or a maximum of 12 hours if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the "Guide to the Evaluation of Educational Experience in the Armed Forces," issued by the Committee on Accreditation of Service Experience. Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

5. *Correspondence Courses.*—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college

level which are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

III. The minimum requirement for the Associate in Arts in General Studies degree is 60 semester hours; the minimum requirement for the Bachelor of General Studies degree is 120 semester hours. A minimum of 18 semester hours for the Associate's degree and a minimum of 30 hours for the Bachelor's degree must be completed at George Washington University, but may be completed at any point in the student's program of study. At least 6 semester hours in the selected area of concentration must be taken at this University.

IV. The College of General Studies will handle and coordinate administrative matters and be the point of contact with the college granting the degree. The provisions as stated in the *College of General Studies Bulletin* will apply in all cases not specifically mentioned in this agreement.

V. Tuition and fees will be as stipulated in the *College of General Studies Bulletin* on a year-to-year basis.

VI. Students accepted under this program are subject to the probation and suspension regulations of the University, and are required to maintain scholastic standards.

VII. In addition to trained counselors, University representatives are assigned to each installation to assist in the counseling function.

Accelerated Degree Completion Program

The Accelerated Degree Completion Program is available at the Washington Navy Yard in the District of Columbia.

This accelerated program may permit an individual to complete the degree of Associate in Arts in General Studies or Bachelor of General Studies in approximately 20 months through part-time study. Time to complete the program will vary according to the amount of advanced standing granted through transfer of credit or by examination and according to the number of courses the student is enrolled in. The program is designed for the highly motivated individual who must complete a program of study in a limited period of time. Courses are seven weeks in length; two nights a week.

Graduate School of Arts and Sciences

The faculty of the Graduate School of Arts and Sciences has academic jurisdiction over the degrees of Master of Arts in the field of Religion and Medical Care, Master of Forensic Sciences, Master of Arts in Special Studies, and Master of Science in Special Studies. When offered at off-campus locations these programs are administered by the College of General Studies.

MASTER OF ARTS

THE DEGREE OF MASTER OF ARTS with a field in Religion and Medical Care is a degree program offered by the Graduate School of Arts and Sciences under the direction of the Department of Religion.

The program of study is interdisciplinary and combines both professional nd academic work. The intent of the program is (1) to provide training in n academic graduate milieu of chaplains and clergymen whose professional ffectiveness might be increased through the combination of clinical experience nd academic study; (2) to provide a program of study for those medical stu- ents who have a sense of the significance of theological insights for the care f the whole person and who desire to combine their medical education with his correlative study; and (3) to provide a program of research and study in he area of religion and medical care for those whose theological training (e.g., n ethics or sociology of religion) and interest are directed toward a vocation a teaching. Support for the program comes from (1) clinical training pro- rams of the National Naval Medical Center, National Institutes of Health, nd Walter Reed General Hospital; and (2) the departments of Health Care dministration, Psychology, Religion, and Sociology, and departments of the chool of Medicine and Health Sciences.

The program of study leading to the degree of Master of Arts in the field f Religion and Medical Care consists of 36 semester hours of approved course ork with or without a thesis and the passing of a Master's Comprehensive xamination.

For information concerning admission requirements and the specific require- ents for the degree, contact the Graduate School of Arts and Sciences or the airman of the Department of Religion.

ASTER OF FORENSIC SCIENCES

recognizing the need for professionals qualified in law enforcement and crim- al investigative career fields, the faculty of George Washington University's raduate School of Arts and Sciences has developed a curriculum leading to the egree of Master of Forensic Sciences.

This degree program includes course work in a wide range of forensic science ills. It is designed for the individual who does not plan to become a forensic ientist, but whose profession requires knowledge in the forensic sciences. In- atigators, lawyers, physicians, and supervisors in investigative units will de- lop useful skills and knowledge through this program of study. Students in- nding to pursue careers in areas of forensic science where expertise is gained rough apprenticeship training will find this degree program valuable to the ld of forensic science.

Courses are offered at off-campus locations in a planned two-year sequence meet the requirements of candidates who wish to complete the degree on a rt-time basis.

ASTER OF ARTS IN SPECIAL STUDIES AND ASTER OF SCIENCE IN SPECIAL STUDIES

ese degree programs provide a course of study appropriate to those students o wish to emphasize interdisciplinary work. They are offered both on and campus. The off-campus programs can only be offered for a group of stu- nts with mutual educational goals. The programs allow a maximum of xibility; however, they must be developed around identified objectives and ust provide a structured sequence of study toward these goals. University presentatives will work with interested groups to develop suitable programs.

The contemplated curriculum must be approved prior to admission to the Graduate School. A student interested in interdisciplinary work leading to one of these degrees who is not in a group program must register on campus.

Regulations

For detailed information on the regulations of the Graduate School of Arts and Sciences, see the *Handbook for Graduate Students* and the *Undergraduate and Graduate Bulletin*, available at the office of the dean of the Graduate School of Arts and Sciences.

Academic Workload

A full-time student in the Graduate School of Arts and Sciences registers for nine to 12 semester hours each semester; a part-time student must register for six semester hours each semester. These requirements do not apply when a student has fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete their program. No student may take more than 15 semester hours during any one semester.

Admission

For detailed information, see "Admission as a Degree Candidate," page 16, and page 20.

Requirements for the Degrees

The program of study consists of 36 semester hours of course work including a majority of courses in the arts and sciences (e.g., economics, natural sciences, political science, psychology, sociology, statistics), with not more than one-third from any single department. *There are no thesis or tool requirements.* Advanced undergraduate courses (those numbered 101–200) may be included in the program of study upon the approval of the Graduate School and with the provision that students complete additional work for graduate credit.

Each program of study must be approved by the dean of the Graduate School of Arts and Sciences and the program advisors.

RESIDENCE

A minimum of 27 semester hours must be completed in residence after admission to Master's degree candidacy.

SCHOLARSHIP

Graduate students are expected to maintain a minimum accumulative grade average of *B* (3.00) in all course work in the program of studies. Individual departments may require a higher average.

In the case of a student who receives a grade of *F* for a course in his program of studies, the Graduate School will require a written statement from the department justifying the student's continuance in the Graduate School and outlining the program to be followed. Continuation is contingent upon the dean's approval. When a grade of *F* is received for a course in the program of studies, the grade is included in the student's grade point average whether or not the course is repeated.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete), *IP* (Progress), *W* (Authorized Withdrawal) and *Z* (Unauthorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—An "Incomplete" must be made up before the lapse of one calendar year. An "Incomplete" which is not removed within one calendar year remains as a grade of *I* on the student's record. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

MASTER'S COMPREHENSIVE EXAMINATION

Master's degree candidates must pass a Master's Comprehensive Examination administered by the Graduate School of Arts and Sciences.

A student who fails to pass the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled date. If the exam is failed a second time, no further opportunity to take the examination is permitted.

Withdrawal

Graduate students who intend to withdraw from the Graduate School of Arts and Sciences should inform the School in writing. The last day for complete withdrawal without academic penalty is at the end of the eighth week of classes.

Leave of Absence

A student who is temporarily unable to continue the program of studies may request leave of absence for a specific period of time, not to exceed one calendar year during the total period of degree candidacy. When the period of leave has expired, it is the student's responsibility to notify the Graduate School at least two months in advance of a given registration period of the intention to re-register. If a student fails to re-register, candidacy is terminated.

SPECIAL DEGREE PROGRAMS

Master of Arts and Master of Science in Special Studies degree programs offered off campus through the Graduate School of Arts and Sciences are described below. For further information regarding these programs contact the office of the Dean of the Graduate School of Arts and Sciences, telephone 676-7410, or Douglas H. Carter, Sr., Assistant Dean, College of General Studies, telephone 676-7022.

Master of Arts in Special Studies (Criminal Justice)

This interdisciplinary degree program consists of study in criminology, forensic sciences, law, management science, psychology, and sociology, and is particularly appropriate for law enforcement personnel or for students considering a career in law enforcement.

Master of Arts in Special Studies (Energy Policy)

Decisions regarding the production and consumption of energy resources require a multi-disciplinary approach to the complex trade-offs involved. The program in energy policy provides those in both government and the private sector an opportunity to examine and better understand the technical, social, and political factors involved in these decisions.

Master of Arts in Special Studies (Legislative Affairs)

The program, focusing on the Congress of the United States, includes course work in legislative theory and research, the processes of politics, and public policy analysis.

Master of Arts in Special Studies (Social and Organizational Behavior)

An interdisciplinary program which emphasizes work in psychology, sociology, and human resources development. It is designed to provide participants with the conceptual framework for understanding interpersonal and social relationships, particularly within an organizational setting; an appreciation for the role of effective communication and a knowledge of techniques of counseling and group facilitation; an understanding of the sociology of work, and of its impact on organizational structure, personnel retention, program development, and career growth; and a background in social systems, the nature of leadership, and the process of organizational change.

Master of Arts in Special Studies (Urban Learning)

The curriculum of this off-campus program is designed to improve the urban educator's and city teacher's understanding of the environment in which he or she operates, with emphasis on social problems.

Master of Science in Special Studies (Employment Policy)

This program answers demands in employment and human resource development for realistic, interdisciplinary approaches and for sophisticated analysis of problems. Students develop a broad base in economic policy, social and behavioral theory, management theory and practice, and public policy analysis.

Master of Science in Special Studies (Environmental Science)

An off-campus program curriculum designed to improve the student's understanding of the environment in which he or she operates with emphasis on problems of the work place. It includes industrial hygiene and health, environmental impact, economics and resource management, technology and public policy, and biostatistics. The program of study was developed in cooperation with the Department of Labor officials to meet the professional requirements of personnel in the occupational safety and health fields.

Master of Science in Special Studies (Oral Biology)

This program is offered in cooperation with the Army Institute of Dental Research of the Walter Reed Army Medical Center. It is open to dental officers serving on active duty with the U.S. Armed Forces or with other federal agencies.

Master of Science in Special Studies (Regulatory Policy)

A program which was designed to provide knowledge of relevant institutional aspects of regulatory policies and procedures, and to develop analytical capabilities for participation in and evaluation of these policies and procedures.

Master of Science in Special Studies (Social and Economic Statistics)

Only students at the International Statistical Program Center of the U.S. Bureau of the Census may enroll in this program. It is designed to give a knowledge of the theories, concepts, principles, and literature of social and economic statistics, and background and management leadership in staff development as it relates to planning and implementation of statistical analyses. The curriculum includes demographic and statistical methods, management and organization, and economic and social development.

Master of Science in Special Studies (Telecommunication Policy)

Through this program personnel with technical backgrounds in communications are introduced to related work in the fields of business administration, economics, management science, political science, sociology, and statistics.

School of Engineering and Applied Science

Associate Director, Joint Institute for Advancement of Flight Sciences, NASA-Langley Graduate Program: R. H. Korkegi, Visiting Professor of Engineernig and Applied Science, 2101 L St., Room 801, Telephone 676-4959

Program Advisor of Coastal Engineering Research Center, Fort Belvoir, Va.: J.E. Weir, Professor of Civil Engineering, Tompkins 109, Telephone 676-7179

The faculty of the School of Engineering and Applied Science has academic jurisdiction over the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science, and over the Professional degrees. When offered at off-campus locations, these programs are administered by the College of General Studies.

MASTER OF SCIENCE

George Washington University in cooperation with the National Aeronautics and Space Administration's Langley Research Center, has a full-resident, graduate engineering program at NASA-Langley, in Hampton, Va. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

The program at NASA-Langley leads to the degree of Master of Science in the fields of acoustics, aeronautics, electrical engineering and computer science, environmental modeling, fluid mechanics and thermal sciences, solid mechanics and materials engineering, and structures and dynamics. These programs are open to qualified NASA employees and area residents. With the approval of the instructor, courses may be taken in nondegree status.

Programs in both electrical engineering and computer science are offered at the Westinghouse Defense and Electronic Systems Center, Baltimore, Md., and in computer science at the Naval Air Station, Patuxent River, Md.

Admission

For detailed information see "Admissions as a Degree Candidate," page 16, and page 21.

Requirements for the Degree

The minimum Master's degree program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to six semester hours). With the approval of the department the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an advisor. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's advisor and the appropriate department chairman.

SCHOLARSHIP

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; and *CR*, Credit (for satisfactory thesis completion); *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. Students who receive two grades of *F*, or three grades below *B*, are barred from further enrollment in graduate courses and, ordinarily, will not be readmitted to graduate study.

GRADUATION

Non-thesis Option.—A student may graduate with either:

1. 33 credit hours of *B* or better course work, with no more than two grades below *B* of which only one *F* is permitted; or
2. A 3.00 quality-point index with a minimum of 33 credit hours of course work, with no more than two grades below *B* of which only one *F* is permitted.

Thesis Option.—In addition to 6 credit hours of acceptable thesis course work, a student may graduate with either:

1. 24 credit hours of *B* or better course work, with no more than two grades below *B* of which only one *F* is permitted; or
2. A 3.00 quality-point index with a minimum of 24 credit hours of course work, with no more than two grades below *B* of which one *F* is permitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking as equivalent elsewhere. An incomplete which is not removed within one calendar year is automatically changed to an *F*.

RESIDENCE

All work for the degree must be done in residence except when special permission is granted by the chairman of the department.

MASTER'S THESIS

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course 299, the candidate must submit the thesis area to the appropriate department chairman, on the form obtainable at the School office and approved by the faculty advisor. The thesis title must be submitted to the dean, on the form available in the School office, at the beginning of the semester in which graduation is expected. Registration in Thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. Students may consult the advisor, but they have primary responsibility for the thesis.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student may be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis 300 and pay tuition for a repeated course. The overall time limit for earning the degree (see page 62) may not be exceeded.

A thesis may be submitted in final form once. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination Committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

OPTIONAL MASTER'S PROGRAM WITHOUT A THESIS

With the approval of the department, the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

MASTER'S COMPREHENSIVE EXAMINATION

After completing the prescribed program, the student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the examination satisfactorily, the student's graduate status terminates.

TIME TO COMPLETE MASTER'S DEGREE REQUIREMENTS

A full-time student in the Master's program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first graduate-student status registration in prerequisite or graduate courses. A part-time student in the Master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman and approved by the dean.

MASTER OF ENGINEERING ADMINISTRATION

The School of Engineering and Applied Science, in cooperation with Aberdeen Proving Ground, Md.; Aeronautical Radio, Inc., Annapolis, Md.; the Fairfax County Government, Fairfax, Va.; Goddard Space Flight Center, Greenbelt, Md.; Hunt Valley Industrial Complex, Cockeysville, Md.; Central Virginia Industries, Lynchburg, Va.; NASA-Langley Research Center, Hampton, Va.; Naval Ordnance Station, Indianhead, Md.; and Richard Montgomery High School, Rockville, Md., offers a graduate program leading to the degree of Master of Engineering Administration. The program is open to employees of these organizations and area residents.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 21.

Requirements for the Degree

The requirements for the degree of Master of Engineering Administration are the same as those listed under the degree of Master of Science.

PROFESSIONAL DEGREE PROGRAM*

The School of Engineering and Applied Science has established the Professional degree program to provide an educational program for those students who are interested in pursuing course work beyond the master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the Professional degree program leads to the degree of Engineer or the degree of Applied Scientist.

In the Professional degree program, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual by concentration on principles and their application. This approach is intended to provide students a technical flexibility for successful adaptation to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements. This program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Courses in the fields of electrical engineering and computer science are offered at the Westinghouse Defense and Electronics Systems Center, Baltimore, Md. It should be noted, however, that some courses in this program are offered only on campus.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 22.

REQUIREMENTS

1. *Engineer.*—To study toward the degree of Engineer, an applicant must possess a bachelor's degree and a master's degree in an area of engineering.

2. *Applied Scientist.*—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in either engineering, mathematics, or natural science; and a master's degree in either engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background may be considered as special cases by the respective departments.

Scholarship

No student studying for the Professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of 3.00 to receive the degree.

DOCTOR OF SCIENCE*

The Doctor of Science degree program offered by the School of Engineering and Applied Science is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest. The doctoral program for each student is determined, on an individual basis, by the student and the advisor. Work for the doctoral degree must be done in resi-

*Complete information on the Professional degrees and the Doctor of Science programs is contained in the *School of Engineering and Applied Science Bulletin.*

dence on campus except when special permission is granted by the chairman of the department.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 22.

Requirements for the Degree

The program of study for the degree of Doctor of Science is divided into two stages. The first—made up of a study of interrelated fields of learning which supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination. The general requirements for the Doctor of Science degree are (1) a minimum of 30 semester hours of credit in a formal program at the graduate level beyond the master's degree in preparation for the qualifying examination; (2) a reading knowledge of one foreign language, preferably Russian; (3) the satisfactory completion of the qualifying examination; (4) a dissertation, equivalent to a minimum of 24 semester hours; and (5) the satisfactory passing of the final oral examination.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 500 words) of the dissertation no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the School office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation, and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library where bound copies are available for circulation.

LANGUAGE REQUIREMENT

A doctoral student should maintain a broad outlook as he pursues his study, and therefore must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language, preferably Russian, must be demonstrated before admission to the qualifying examination. If the student wishes to satisfy this requirement with a language other than Russian, approval must be obtained from the doctoral advisor and the department chairman; permission to use a language other than Russian will be granted on the basis of its importance to the student's field of interest.

TOOL REQUIREMENT

In addition to the language requirement, an examination in a tool requirement (e.g., computer programming) may be established by the various departments.

SCHOLARSHIP

To be admitted to the qualifying examination, the doctoral student must achieve an overall academic average of 3.20 (a grade of *A* equals 4 points; *B*, 3 points; *C*, 2 points; and *F*, 0 points). No doctoral student may receive more than two course grades below *B*. If more than two course grades below *B* are received, his graduate study is terminated and his further enrollment prohibited. Courses in which the student earns grades below *B* are not included in the total semester-hour requirement for the degree. A student who receives any grade below *B* is required to consult with the advisor for a review of the student's program of study and discussion of possible changes therein.

School of Education and Human Development

The faculty of the School of Education and Human Development has academic jurisdiction over the Bachelor of Arts in Education and Human Development, the Master of Arts in Education and Human Development, and the Education Specialist degrees. When offered at off-campus locations these programs are administered by the College of General Studies.

BACHELOR OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

The Bachelor of Arts in Education and Human Development with a concentration in human services is offered at the Washington Hospital Center. The program in human services is designed for personnnel in such human service occupations as nursing, gerontology, mental health, and criminal justice.

The program is planned to: (1) enable individuals to develop their cognitive and affective abilities; (2) meet a range of human service needs; (3) develop human interaction and leadership skills; (4) facilitate entry into or advancement in human services occupations; (5) gain an awareness and appreciation for interacting values in a pluralistic society; and (6) prepare for graduate study in a professional field.

Degree candidates have first priority in course registration. Individual courses will be open to qualified nondegree candidates on a space available basis.

Admission

For detailed information see "Undergraduate Degree Candidacy and Advanced Standing—School of Education and Human Development," pages 19–20.

Requirements for the Degree

To be recommended for degree candidacy, a student must satisfy the admission, residence, scholarship, and curriculum requirements. The Bachelor of Arts degree in Education and Human Development with a concentration in

human services requires 120 semester-hours of course work. For further information see the *Undergraduate and Graduate Bulletin*.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily a minimum of 30 semester-hours while in the School of Education and Human Development.

MASTER OF ARTS IN EDUCATION AND HUMAN DEVELOPMENT

Master of Arts in Education off-campus degree programs are designed for educators who wish to increase their knowledge of professional and academic information and to prepare for special types of educational service in public and private schools. They are also designed to further the preparation of individuals for non-traditional areas of education in both the public and private sectors of society, regardless of clientele, age, or institutional base.

The Master of Arts in Education and Human Development degree programs offered at off-campus centers are available in the following fields: adult education, elementary education; generic counseling; higher education; human resource development; reading; secondary education; special education; early childhood special education, vocational/special education; and supervision and human relations.

Academic Workload

A full-time student in the School of Education and Human Development may register for nine or more semester hours. The maximum permissible load for a part-time student is six semester hours.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 20.

Requirements for the Degree

The program of study consists of a minimum of 33 to 48 semester hours of graduate course work in core courses, depending upon the chosen field. The thesis (equivalent to six semester hours) is optional.

RESIDENCE

Advanced standing is granted for approved courses taken at other accredited institutions; however, a minimum of 24 semester hours must be completed at this University as a master's candidate.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive a grade of *C* in more than six semester hours are subject to suspension. Students who receive a grade of *F* must confer with the Dean of the School of Education and Human Development before enrollment for further work.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—An instructor recording a grade of *I* will normally stipulate a date by which work must be completed. The instructor has the responsibility for changing the grade of *I* to an appropriate grade upon completion of work, or, if work is not completed by the stipulated date, determining whether the grade of *I* should be changed to *F* or allowed to remain in the record. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

THE THESIS

Students who elect a thesis must register on campus for Educ 299–300. The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School of Education and Human Development standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends beyond the additional time granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

TAKING COURSES ON CAMPUS

A student registered in a degree program off campus who wishes to register for a course on campus, *must* file a formal graduate application which may be obtained from the office of the dean of the School of Education and Human Development.

MASTER'S COMPREHENSIVE EXAMINATION

In addition to course examinations, the candidates may be required to pass a special three-hour comprehensive examination in the area of specialization. Candidates for the examination must be registered for the semester during which it is to be taken, and must file a written application in the office of the dean of the School of Education and Human Development no later than 30 days prior to the date of the examination. Degree candidates in programs requiring 33 semester hours may, with the approval of their academic advisors, take an additional three-semester-hour course in lieu of a comprehensive examination. Degree candidates in programs requiring 36 semester hours or more may waive the comprehensive examination with the approval of the academic advisor.

EDUCATION SPECIALIST

The School of Education and Human Development provides off-campus programs of advanced study leading to the degree of Education Specialist in the fields of administration and higher education. The program is for students with master's degrees in education who seek further professional preparation.

Admission

For detailed information see "Admission as a Degree Candidate," page 16 and pages 21–22.

Requirements for the Degree

A minimum of 30 semester hours beyond the requirements for the degree of Master of Arts in Education and Human Development is required. At least 21 hours of this work must be taken on campus at this University; with the approval of the advisor, the remaining semester hours of the program may be taken in off-campus offerings of this College or at another approved university. A maximum of five calendar years is allowed for completion of the program. At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, (3) an area of specialization.

SCHOLARSHIP

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education (see page 20).

THE COMPREHENSIVE EXAMINATION

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

School of Government and Business Administration

STATEMENT OF PURPOSES

The School of Government and Business Administration is a center dedicated to academic excellence through the study, teaching, and research of management and policy in the public and private sectors, both within the United States and internationally.

Over a span of half a century, the School of Government and Business Administration has developed a learning community in which mature individuals can prepare themselves to assume membership and leadership roles in society. The School practices a multi-disciplinary approach with a flexibility in educational programming in the belief that such is essential to dealing with the complexities of today's organizational society. The School offers preparation of both

the generalist and the specialist for professional careers, and seeks to improve the quality and character of the individual as citizen, professional, and scholar as well.

More specifically, the purposes of the School are:

1. To prepare its graduates for positions in the management of complex organizations.
2. To provide a broad and fundamental education as preparation for positions carrying management and leadership responsibilities.
3. To provide specialized educational opportunities as preparation for career positions in professional disciplines or functional areas.
4. To explore in all their forms, through education and research, the content, interactions and interdependencies of disciplines and institutions in the public and private sectors, both nationally and internationally.
5. To make available the School's resources to business, health, government, community and other organizations in both the metropolitan area and the larger community.
6. To foster understanding and advancement of knowledge and skills in the world community through research, education and scholarly exchange with governments, institutions and organizations engaged in the solution of international trade and investment problems, and the management of human settlements.

OFF-CAMPUS LOCATIONS OF THE COLLEGE OF GENERAL STUDIES

DISTRICT OF COLUMBIA

FEDERAL AFTER-HOURS PROGRAM

Undergraduate courses leading toward an Associate in Arts or Bachelor of General Studies degree are offered after working hours in various downtown federal buildings in Washington, D.C. Persons seeking professional development/self-enrichment courses may enroll as non-degree students.

Registration for these courses is held each semester at the Department of Commerce Building (Conference rooms A, B, C, and D off the lobby), 14th Street and Constitution Avenue, N.W. from 10 a.m. to 2 p.m.

Representative for the University: Ron Morrison
Telephone: 676-7018

Open to federal employees and the general public.

Federal Communications Commission, Washington, D.C. 20554

Education Director: Thomas Tate
Office: Room A-108, 1229 20th Street, N.W.
Telephone: 632-6304 or 632-6385

Representative for the University: LeRoy S. Paul
Telephone: 676-7062

Federal Mediation and Conciliation Service, 2100 K Street, N.W., Washington, D.C. 20427

Assistant Director of Administration for Administrative Services: Dan Funkhouser
Telephone: 653-5310

Representative for the University: Norma Calhoun
Telephone: 676-7023

Forrestal Building, L'Enfant Plaza, Washington, D.C. 20314

Education Services Officer and Program Coordinator: Fred McKinney
Office: Room GE222, Forrestal Building
Telephone: 693-8484 or 693-8485

Representative for the University: Norma Calhoun
Telephone: 676-7023

Open to active duty military personnel, Department of Defense civilians, retired military personnel and other federal employees

Library of Congress, Washington, D.C.

Training Officer: Sylvia C. Martin
Telephone 287-6348
Representative for the University: Nancy D. Berns
Telephone: 676-7067

Marine Barracks, 8th and I Sts., S.E., Washington, D.C. 20390

Education Services Officer: Captain Jay Paxton, USMC
Telephone: 433-4073/4295/4296
Representative for the University: Nancy D. Berns
Telephone 676-7067
Open to military and non-military personnel

National Labor Relations Board, 1717 Pennsylvania Avenue, N.W., Washington, D.C. 20570

Chief, Employee Development Section: Augustus Haskins
Telephone: 254-6348
Representative for the University: call 676-7022
Open to N.L.R.B. Employees

Naval Telecommunications Command, 4401 Massachusetts Avenue, N.W., Washington, D.C. 20370

Education Director: Mike Argerbright
Telephone: 282-0371
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

United States Army Institute of Dental Research Walter Reed Army Medical Center, Washington, D.C. 20012

Chief, Professional Development: Major George Allen
Office: Building 40
Telephone: 576-3258
Representative for the University: Edward B. Wright
Telephone: 676-7024
Open to military personnel assigned to duty and graduate study at USAIDR

U.S. Department of Commerce, Bureau of the Census, International Statistical Programs Center, Washington, D.C. 20233

Chief, Training Branch: Kenneth R. Bryson
Telephone: 763-2860
Representative for the University: George Loines
Telephone: 676-7046
Restricted to selected foreign nationals who are students of the I.S.P.C.

Washington Hospital Center, 110 Irving St., N.W., Washington, D.C. 20010

Director of Human Resources: Veda Ross
Telephone: 541-6357
Training Officer: Sam Harris
Telephone: 541-7323
Representative for the University: Nancy D. Berns
Telephone: 676-7067

Washington Navy Yard, Washington, D.C. 20374

Glenn C. Archibald, Head, Education and Training Branch
Office: Building 92, Anacostia Naval Station
Navy Campus for Achievement: James Wood
Office: Building 92, Anacostia Naval Station
Telephone: 433-3182
Employee Development Officer: Doris Moore
Office: Room 202, Building 172, M and 9th Streets, S.E.
Telephone: 433-4954
Representative for the University: Nancy D. Berns
Telephone: 676-7067
Open to government and nongovernment employees

MARYLAND

Aberdeen Proving Ground, Md. 21005

Aberdeen Area Education Director: John L. Lichi, Chief, Educational Services Division
Office: Building 3146, Army Education Center, Aberdeen Proving Ground, Md. 21005
Telephone: (301)278-3385
Representative for the University: John Williams
Telephone: (202) 676-7029
Open to everyone by permission of the Commanding Officer of Aberdeen Proving Ground

Andrews Air Force Base, Washington, D.C. 20331

Education Services Officer: Floyd J. Flynn
Office: Building 3484
Telephone: 981-6377
Representative for the University: Laurie Berrett
Telephone (202) 676-7398
Open to military and civilian personnel of the Air Force and to others by permission

Defense Mapping Agency, Topographic Center, Bethesda, Md. 20315

Education Director: Gene Hastings, Chief, Training and Development Division
Office: Erskine Hall, 6500 Brooks Lane
Telephone: 227-2147
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to employees of the Defense Mapping Agency, Topographic Center, and others by permission, obtained at least one week prior to the first week of classes, from the Training and Development Division, Telephone 227-2147

Edgewood Arsenal, Md. 21010

Education Officer: Robert P. Mehr
Office: Building 4475, Edgewood Arsenal, Md. 21010
Telephone: (301)671-2166
Representative for the University: John Williams
Telephone: (202)676-7029
Open to everyone by permission of the Commanding Officer of Edgewood Arsenal

Fort George G. Meade, Md. 20755

Education Director: Bruce Blevins
Office: Building B393, Army Education Center
Telephone: (301)677-6421
Representative for the University: John Williams
Telephone: (202)676-7029
Open to everyone by permission of the Commanding Officer of Fort George G. Meade

Goddard Space Flight Center, Greenbelt, Md. 20771

Employee Development: John Daniels
Telephone: 344-5087
Representative for the University: Edward B. Wright
Telephone: (202)676-7024

Montgomery County Public Service Training Academy, Rockville, Md. 20850

Education Director: Karen J. Plucinski, Coordinator, Police Professional Advancement Program
Office: Public Service Training Academy, 10025 Darnestown Road
Telephone: 279-8250
Representative for the University: Robert Engle
Telephone: (202)676-7025
Open to Montgomery County employees and to others by permission

National Naval Medical Center, Bethesda, Md. 20014

Education Director: Nick Szabados, Head, Training and Educational Services
Office: Building 123
Telephone: 295-1751
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to military and civilian personnel of the Navy, employees of the National Institutes of Health, and to others as space permits

National Oceanic and Atmospheric Administration, Rockville, Md. 20852

Education Officer: Daniel E. Bella
Office: Room 316, North Bethesda Office Center II, 5640 Nicholson Lane, Rockville, Md. 20852
Telephone: 443-8626
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to all employees of the Department of Commerce and to others by permission

Naval Academy, Annapolis, Md. 21402

Coordinator for the University Programs: William W. Jeffries, Archivist, U.S. Naval Academy
Office: Nimitz Library
Telephone: (301)267-2178
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military personnel, civilian government employees, and to others by permission

Naval Air Station, Patuxent River, Md. 20670

Ted White, Head, Employee Development; Wanda Denton, Employee Development Specialist
Office: Naval Building 463, Civilian Personnel Department
Telephone: (301) 863-3734/3735
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military and civilian personnel of the Navy and to others by permission

Naval Graduate Dental School, Bethesda, Md. 20014

Commanding Officer: Captain Harry C. Pebly, USN
Education Director: Captain Robert Cassidy, USN
Office: Building 122
Telephone: 295-0064
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military personnel assigned to duty and graduate study at the Naval Graduate Dental School

Naval Ordnance Station, Indian Head, Md. 20640

Edward Drinks, Head, Training Division
Telephone: (301)743-4506
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to everyone by permission of the officer in charge of the station

Naval Ship Research and Development Center, Annapolis, Md. 21402

Frank Draper, Head, Training Division
Telephone: (301) 267-3454
Representative for the University: Laurie Berrett
Telephone: (202) 676-7398
Open to military personnel, civilian government employees, and to others by permission

David W. Taylor Naval Ship Research and Development Center, Carderock, Md. 20007

Don Haveland, Head, Training Division
Office: Room 113A, Building 8
Telephone: 227-2867
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to military personnel and civilian employees of the Naval Ship Research and Development Center and to others by permission

Naval Ships Engineering Command (see Prince Georges Center Building)

Parklawn Building, Rockville, Md. 20852

Education Director: Larry Livingston
Office: Room 3A25, 5600 Fishers Lane
Telephone: 443-7690

Representative for the University: Robert Engle
Telephone: (202)676-7025
Open to employees of the Department of Health, Education, and Welfare and to others by permission

Social Security Administration, Baltimore, Md. 21235

Director, Center for Continuing Education: Eric Levi
Office: Room 4-L-11, Annex Building, Division of Training and Career Development, 6401 Security Boulevard
Telephone: (301)594-4529
Representative for the University: John Williams
Telephone: (202)676-7029
Open to employees of the Social Security Administration and to others by permission

Westinghouse Defense and Electronic Systems Center, Baltimore, Md. 21203

Manager, Education and Technology Training: Stanley F. Block
Office: Baltimore-Washington International Airport, Box 1693
Telephone: (301) 765-7441/7442
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to Westinghouse employees and to others by permission

VIRGINIA

Crystal City, Jefferson Davis Highway, Arlington, Va. 22203

Including: Jefferson Plaza; Crystal Square; Crystal Mall; Crystal Plaza: National Center)
Navy Campus Education Office: Betty Kirkpatrick
Crystal Mall #3, Room 101
Telephone 697-7644
Representative for the University: William C. Robinson
Telephone: 676-7064
Open to military and civilian personnel of the Department of Defense and others on space-available basis.

Fairfax High School, 3500 Old Lee Highway, Fairfax, Va. 22030

Assistant Principal: Patrick L. Laing
Telephone: 591-3525, -8350; Ext. 69
Representative for the University: William C. Robinson
Telephone: 676-7064

U.S. Army Engineer Center and Fort Belvoir, Va. 22060

Education Director: Allen C. Reed
Office: Building T-1483
Telephone: 664-6980
Representative for the University: Herbert Berthold
Telephone: 676-7014
Open to military and civilian personnel of the Army and to others by permission

Langley High School, 6520 Georgetown Pike, McLean, Va. 22101

Representative for the University: William C. Robinson
Telephone: 676-7064
Open to all qualified students

Lynchburg Virginia Center, First and Merchants Bank Building, Room 606 Lynchburg, Virginia 24504

Resident Coordinators: K. Dallas Wade
Telephone: (804)845-6035
and Patricia Mallis
Telephone: (804) 846-1262
Representative for the University: Alvin C. Jensen
Telephone: 676-7020

The Pentagon, Washington, D.C. 20310

Director of the Pentagon Education Center, Chairman of the Armed Forces Education and Training Advisory Council, and Education Officer for the U.S. Army: Philip F. Strauss
Office: Room 3C147, Pentagon
Telephone: 694-4514

U.S. AIR FORCE

Education Officer: Edwin Corbin
Office: Room 5E410, Pentagon
Telephone: 697-1863 or 697-7074
Representative for the University: William C. Robinson, Room 3C155, Pentagon
Pentagon Telephone: 694-4514
University Telephone: 676-7064
Open only to active duty and retired military personnel and all federal employees

U.S. Geological Survey National Center, Topographic Division, 12201 Sunrise Valley Drive, Reston, Va. 22092

Education Officer: Ellen Antholis, Employee Benefits Officer
Telephone: 860-6221
Representative for the University: Laurie Berrett
Telephone: 676-7398

Westgate/Westpark Education Center, Rt. 123, Tyson's Corner, McLean, Va. 22101

Personnel Services Administrator: Martha McGee
Office: Personnel Office, MITRE Corporation
Telephone: 827-6671
Representative for the University: William C. Robinson
Telephone: 676-7064

OFF-CAMPUS LOCATIONS OF EDUCATION COURSES FOR TEACHERS

District of Columbia Public Schools

ROOSEVELT HIGH SCHOOL, 13TH & UPSHUR ST., N.W.
Representative for the University: George D. Loines
Telephone: 676-7046

WOODSON HIGH SCHOOL, 45TH & EADS ST., N.E.

Representative for University: George D. Loines
Telephone: 676-7046

Charles Tri-County Center, Waldorf, Md. 20601

Maurice Dunkle, Program Counselor
Office: Thomas Stone High School (Open 4-7 p.m.)
Telephone: (301)843-6461
Representative for the University: Kay Malone
Telephone: (202)676-7249

CALVERT COUNTY PUBLIC SCHOOLS, PRINCE FREDERICK, MD. 20678

David L. Brown, Director of Personnel Services
Office: Calvert County School Board, Dares Beach Road
Telephone: (301)535-1700

CHARLES COUNTY PUBLIC SCHOOLS, LA PLATA, MD. 20646

Roy Yanosh, Director of Personnel Services
Office: Charles County Board of Education, Health and Education Building
Telephone: (301)934-4671

ST. MARY'S COUNTY PUBLIC SCHOOLS, LEONARDTOWN, MD. 20650

Kenneth D. Rigby, Supervisor in Personnel
Office: St. Mary's County School Board of Health Building
Telephone: (301)475-8971

Prince Georges County Public Schools, Upper Marlboro, Md. 20870

Maurice Erly, Coordinating Supervisor of Staff Development and In-Service Training
Office: Prince Georges County School Board
Telephone: 627-4800, Extension 218
Representative for the University: Kay Malone
Telephone: 676-7249

TIDEWATER CENTER

George Washington University Tidewater Center: James Noel, Assistant Dean
Office: 2019 Cunningham Drive, Hampton, Va. 23666
Telephone: (804) 838-8444
Open to any qualified individual
Serves the cities in the Tidewater area of Virginia and the following government installations:

Camp Elmore, Norfolk, Va. 23511

Education Officer: Captain Jeffrey Andrews, USMC
Telephone: (804)444-6440

Fort Eustis, Va. 23604

Education Director: Michael A. Yannitello
Telephone: (804)878-5508

Fort Lee, Va. 23801

General Education Director: William Brantley
Telephone: (804)734-2605

Fort Monroe, Va. 23351

Education Director: Charles D. Fritts
Telephone: (804)727-2454

Fort Story, Virginia Beach, Va. 23459

Education Director: E.F. Bolick
Telephone: (804)422-7151

Guided Missile School/Fleet Anti-Air Warfare Training Center, Dam Neck, Virginia Beach, Va. 23461

Educational Advisor: William Eberling
Telephone: (804)425-4473

Educational Director (Base): E. R. Case
Telephone: (804)425-4555

Langley Air Force Base, Va. 23365

Education Services Officer: Robert J. Dewey
Telephone: (804)764-2962

NASA-Langley Research Center, Langley Field, Hampton, Va. 23365

Head, Training and Education Services Branch: Malcolm P. Clark
Telephone: (804)827-2611

Naval Air Station, Norfolk, Va. 23511

OIC, PSA; Roy Day
Telephone: (804) 444-1048

Naval Air Station, Oceana, Virginia Beach, Va. 23460

Educational Services Officer: E. F. Boyser
Telephone: (804)425-2182

NCFA: John Quane
Telephone: (804)425-3129

Naval Amphibious Base, Little Creek, Norfolk, Va. 23521

Educational Services Officer: Chief B. R. Thoerig
Telephone: (804)464-7811

Naval Supply Center, Norfolk, Va. 23512

Training Director: W. H. Schenk
Telephone: (804)444-4912

Naval Weapons Station, Yorktown, Va. 23491

Director of Training: William A. Jackson
Telephone: (804)887-4831

U.S. Atlantic Fleet, U.S. Naval Base, Norfolk, Va. 23511

Educational Services Officer: Lt. J. O'Briant
Telephone: (804)444-6945

U.S. Coast Guard, Res. Training Center, Yorktown, Va. 23491

Off-Duty Education Officer: Jim Liss
Telephone: (804)898-3500, Ext. 336

U.S. Naval Regional Medical Center, Portsmouth, Va. 23708

Training Officer: Eugene Rogers
Telephone: (804)397-6541, Ext. 583

U.S. Naval Station, Norfolk, Va. 23511

NCFA: W. Holmgren
Telephone: (804)444-7020

COURSES OF INSTRUCTION

The following pages contain listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. Courses carrying the designation "campus course" are normally offered only on campus. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

EXPLANATION OF COURSE NUMBERS

COLLEGES AND SCHOOLS OTHER THAN ENGINEERING AND APPLIED SCIENCE

First-group courses—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon approval, at the time of registration, of the dean and the instructor. Such approval is granted with the provision that students must complete additional work to receive graduate credit.

Third-group courses—Courses numbered above 200 are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates.

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Courses numbered from 1 through 199 are planned for undergraduate credit, although certain courses may be taken for graduate credit with the advance approval of the instructor and the dean. Courses numbered 201 to 300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered from 301 to 400 are primarily for doctoral students.

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BISc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCS	Health Care Sciences
HSA	Health Services Administration
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opht	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
RSci	Radiological Sciences
Rad	Radiology
RPol	Regulatory Policy
Rel	Religion
SLP	Service-Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish

SpEd	Special Education	**TCom**	Telecommunication Operations
SpDr	Speech and Drama	**U&RP**	Urban and Regional Planning
Stat	Statistics	**Urol**	Urology
Surg	Surgery	**WStu**	Women's Studies

Accounting*

Chairman: A. J. Mastro, Professor of Accounting; Government 209, Telephone 676-5825

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 201 and above may not be taken for undergraduate credit.

1–2 **Introductory Accounting** (3–3)

Basic understanding of accounting concepts, procedures, analyses and reports; the accounting measurement and communications of significant economic and financial data. Prerequisite: sophomore status. Acct 1 is prerequisite to Acct 2. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 1.

220 **Management Accounting** (3)

The role of accounting in the decision-making processes of management; understanding of how accounting influences resource allocation decisions in the organization. Prerequisite: Acct 201.

American Civilization†

Director: B.M. Mergen, Professor of American Civilization; P101, Telephone 676-6970

71–72 **Introduction to American Civilization** (3–3) (campus course)

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance.

192 **The American Cinema** (3)

Joint offering of the American Studies Program and the Speech and Drama Department. History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture.

197 **Oral History and Interview Techniques** (3)

Joint offering of the American Studies Program and the History Department. Introduction to theory and practice of obtaining and using historical

*Fully qualified degree candidates from schools other than the School of Government and Business Administration, who have the necessary prerequisites, can register for up to 12 hours in courses offered by the Accounting, Business Administration, and Management Science Departments.

†Administered by the American Studies Program.

data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

271 Seminar: Scope and Methods in American Studies (3)
Consideration of American studies as an area for research and teaching; introduction to bibliography.

Anthropology

Chairman: Victor Golla, Associate Professor of Anthropology; X-102, Telephone 676-6075

1–2 Introductory Anthropology (3–3)
Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior.

155 Anthropological Approaches to Religion (3)
Joint offering of the Anthropology and Religion Departments. Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change.

157 Primitive Social Organization (3)
Analysis of the social organization of primitive peoples; kinship, economic, and political systems.

165 Introduction to Folklore (3)
History of folklore studies in Europe and America; terminology and study of different folk genres. Same as AmCv 165.

171 Native Peoples of North America (3)
Comparative study of Indian groups representative of each of the continent's culture areas.

185 Latin American Archeology (3)
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Meso-America in odd years. May be repeated for credit.

Applied Science

Interdepartmental offerings. School of Engineering and Applied Science.

115 Engineering Analysis III (3)
Solution of engineering problems using concepts from probability and statistics, including random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, and regression. This methodology applied to problems of

structural design, bioengineering, manufacturing processes, product quality, equipment reliability, engineering management, and societal engineering. Prerequisite: Math 32.

211 Analytical Methods in Engineering I (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of department.

212 Analytical Methods in Engineering II (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of department.

213 Analytical Methods in Engineering III (3)

Analytical techniques for solution of boundary-initial value problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of department.

214 Analytical Methods in Engineering IV (3)

Introduction to variational methods in engineering including Ritz and Galerkin approximation methods of boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of department.

215 Analytical Methods in Engineering V (3)

Advanced methods in solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213.

216 Special Topics in Engineering Analysis (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; (2) application of singular integral equations in problems of mechanics; (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of department.

Art

Chairman: L.F. Robinson, Professor of Art; Building H, Telephone 676-6085

31–32 Survey of Western Art (3–3)

A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art.

71–72 Introduction to the Arts in America (3–3)

Art 71: Colonial beginnings to the Republican age. Art 72: 19th century to the present.

109 19th-Century Art in Europe (3)

110 Contemporary Art (3)

112 Egypt and the Ancient Civilizations (3)
Study of the art of Mesopotamia, Anatolia, Egypt, and Persia.

113 Baroque Art in Italy (3)

115 Christian Iconography (3)
Origins and development of Christian symbols and themes from early Christian to modern times.

117 Medieval Art I (3)
Early Christian and Byzantine.

120 Art of China and Japan (3)

129–30 Principles of Museum Work (3–3)
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service.

141 Interior Design (3)
Principles of decoration dealing with furniture designs and ensemble layout, draperies, color, accessories, and lighting.

145 Folk Arts in America (3)
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

203 Primitive Art (3)

242 Etruscan Art and Archeology (6)
Art and archeology program in Italy.

Biological Sciences

Chairman: S.O. Schiff, Professor of Zoology; Bell 301A, Telephone 676-6090

3–4 Introductory Biology for Nonscience Majors (3–3) (campus course)
Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in the environment. Prerequisite to BiSc 4: BiSc 3. Material fee, $18 per semester.

11–12 Introductory Biology for Science Majors (4–4) (campus course)
Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles are demonstrated through consideration of the plant as an organism. BiSc 12: Beginning principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester.

33 Plants and People (3) (campus course)
A study of the multidimensional relationship between plants and people, past and present. Lectures, observation-discussion sessions, multi-image audiovisual presentations.

Business Administration*

Chairman: S.F. Divita, Professor of Business Administration; Government 301, Telephone 676-6115

51 **Introduction to Business** (3)

Structure, activities, and problems of business enterprise; its contribution to the individual and to society; careers in business.

161 **Commercial Law** (3)

Fundamental concepts and principles of law encountered in business activity; contracts, bailments, agency, sales, negotiable instruments, bankruptcy, other topics. Basic legal considerations in business decision-making.

208 **Personnel Management and Industrial Relations** (3)

Survey of personnel management practices and procedures, including labor-management relations. (A required course for the Master of Arts in Education and Human Development, with a concentration in Human Resource Development.)

210 **The Personnel Manager** (3)

The personnel manager and his or her place in the organization, relation to other executives, policy role and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 208 or permission of instructor. (A required course for the Master of Arts in Education and Human Development, with a concentration in Human Resource Development.)

211 **Leadership and Executive Development** (3)

Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite: Mgt 200 or permission of instructor. (A required course for the Master of Arts in Education and Human Development, with a concentration in Human Resource Development.)

213 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3)

Current problems and issues. Prerequisite: BAd 212. (A required course for the Master of Science in Special Studies, with a concentration in Employment Policy and Human Resource Studies.)

235 **Financial Management** (3)

Cases in financial management; planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 231. (An elective course for the

*Graduate courses listed here are open to degree candidates for the Master of Science in Administration, Master of Arts in Special Studies, Master of Science in Special Studies, and Master of Arts in Education and Human Development, as indicated under the appropriate course listing. Fully qualified degree candidates from schools other than the School of Government and Business Administration, who have the necessary prerequisites, can register for up to 12 hours in courses offered by the Accounting, Business Administration, and Management Science Departments.

Master of Science in Special Studies, with a concentration in Telecommunication Policy.)

241 **Advanced Marketing Management** (3)

For MBA students in concentrations other than marketing. Case analysis of complex marketing problems. Current developments in marketing practice. The relationship of marketing to environmental forces and other business functions. Prerequisite: BAd 240. (An elective course for the Master of Science in Special Studies, with a concentration in Telecommunication Policy.)

280 **Procurement and Contracting** (3)

Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. (An elective course for the Master of Science in Special Studies, with a concentration in Telecommunication Policy.)

285 **Systems Procurement and Project Management** (3)

Major systems acquisition: needs, objectives, and organizational relationships. Design, establishment, and execution of project management plans and procurement processes. Developing adequate intercontractual business relationships within the environment of public procurement. Management of projects under contract. (An elective course for the Master of Science in Special Studies, with a concentration in Telecommunication Policy.)

Cartography*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography; Building F, Telephone 676-7000 or 946-3557

1 **Cartography I** (3)

Introduction to the fundamental concepts and practical applications of cartography. Prerequisite: Math 3, 6, or equivalent.

2 **Cartography II** (3)

Aerial photography, modern topographic and hydrographic mapping and charting, thematic maps, map reliability, planning and design and reproduction. Prerequisite: Cart 1.

102 **Elements of Remote Sensing** (3)

Basic elements of remote sensing. Emphasis on the electromagnetic spectrum, infrared photographic systems, thermal systems, and analysis of multispectral photography and thermal imagery. General characteristics of satellite remote sensing. Prerequisite: Cart 1 and 2 (or equivalent experience), Geod 17, and Math 31.

* Affiliated with the Department of Geography and Regional Science.

104 Photo-interpretation (3)

Interpretation of topographic, vegetative, hydrologic, and man-made features. Civil and military applications. Applications to urban planning and urban-industrial patterns. Use of satellite imagery and remote sensing data. Color aerial photographs and underwater photography. Prerequisite: Cart 102, Geod 17, Math 31.

107 Physiography (3)

Development of physiographic concepts; the earth's crust, weathering, climate, and denudation; stream, shore, wind, and ice processes; glaciation; physiographic regions.

108 Climatology (3)

Causes for climate and weather, air mass movements, water mass movements, physical features of boundaries. Tropics, subtropics, humid and dry continentals, subarctics.

111 Cartographic Techniques (3)

Techniques and procedures, field methods, evaluation of source material, use of scribing and contact screens in color separation, shaded relief, and reproduction. Lectures and laboratory. Prerequisite: Cart 2, Geod 12, Math 3, 6 (or equivalent experience). Note: The charge for this course is $303 which includes $282 for tuition and $21 for materials.

113 Map Design (3)

Functional requirements of various kinds of maps. Principles of human perception and visual communication. Influence of reproduction processes on map design. Optimizing results within constraints of available source material, equipment, time, money, manpower, and reproduction process. Changing tradition of map design. Influence of experimental work and progress in the commercial and fine arts on map design. Role of map design in mapping organizations. Prerequisite: Cart 107 and 111.

115 Cartometrics I (3)

Examination of the application of automatic computing systems to cartography. Course will cover batch processing and time sharing and dedicated mini-computer systems as well as digitigers, plotters, and graphic terminals. Prerequisite: Cart 1, 2.

116 Cartometrics II (3)

Analysis of cartographic computing programs, cartographic data structures and automated mapping data bases. Examination of FORTRAN programming methods as they apply to cartography. Preparation of coordinate transformation programs, map projection programs, and plotting software. Prerequisite: Cart 115, Geod 106, or equivalent experience. Laboratory fee for computer use.

120 Computer Mapping I (3)

The analysis and application of computer mapping methods; techniques for the automation of data bases and the creation of computer generated map output. Students will develop application programs in laboratory sessions. Prerequisite: Cart 115, 116. Laboratory fee for computer use.

121 Computer Mapping II (3)

Advanced applications of computer mapping methods and applications that include 2- and 3- dimensional automated plotter programs. Course will include laboratory sessions and students will develop an advanced seminar project. Prerequisite: Cart 120. Laboratory fee for computer use.

125 Marine Cartography (3)

Exploring the extended and imaginative symbology required to depict a visually opaque environment characterized by sparsity of data; the thematic aspects of oceanographic mapping. Prerequisite: Cart 2.

126 Topographic Mapping (3)

Application of control surveys and photogrammetry to topographic mapping. National Map Accuracy Standards. Systematic application of geographic names. Field completion. Feature classification and symbolization. Map compilation and color separation. Comparison of American and foreign topographic maps and methodologies. Prerequisite: Cart 107, 111; Geod 12, 13.

128 Thematic Mapping (3)

Analysis of the thematic map as a means of communicating qualitative and quantitative data. The function and design of base maps for thematic overprints. Source material research, analysis and manipulation. Map layout and symbol design. Experimental studies to compare the data the cartographer intends to communicate with the map and that actually extracted by the reader. Prerequisite: Math 31, Cart 111, and Geod 106.

131 Techniques in Remote Sensing (3)

The application of remote sensing to earth resource studies with emphasis on the physical characteristics of electromagnetic radiation, multispectral sensing, and photographic and digital image analysis. Satellite systems and the cartographic treatment of remote sensing data. Prerequisite: Cart 102, Math 31, and Phys 1 or 3.

135 Cartographic Photography and Printing (3)

Historical development of map printing since the introduction of photography. Comparison of printing processes. Contact and camera photography. Light sources for the darkroom and exposure. Photographic emulsions, sensitometry and densitometry. Phototypography. Comparison of color-proofing methods. Registration systems. Plate making, press work. Preparation of specifications for contractual printing. Quality control and other managerial problems. Prerequisite: Cart 111.

140 Sensitometry of Photomapping (3)

Construction of tone reproduction curves; optimization of photographic presentation; evaluation of photo materials, equipment, and systems. Prerequisite: Math 31, Phys 1.

142 Mechanics and Kinetics of the Photographic Process (3)

Light, optics, and photometry as applied to the photographic process; sensitometry and densitometry for quality control and assurance; density slicing; image enhancement; auto- and self-dodging; antivegnetting masks.

Chemistry

Chairman: R.E. Wood, Professor of Chemistry; Corcoran 105, Telephone 676-6121

PHYSICAL SCIENCE

3–4 Contemporary Science for Nonscience Majors (3–3)
(campus course)

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological, and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester.

5–6 Contemporary Science (3–3)

Nonlaboratory course for off-campus students only. Survey covering topics in contemporary science: population control, pollution, drugs, food additives, etc.

CHEMISTRY

11–12 General Chemistry (4–4) (campus course)

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester.

201 Environmental Science and Technology (3)

Chemistry and physics of environmental pollution; emphasis on water and air pollution. Instrumental techniques and their limitations. Students present papers emphasizing chemical and physical aspects of an environmental pollutant.

Chinese

See East Asian Languages and Literatures.

Civil, Mechanical, and Environmental Engineering

Chairman: A.B. Cambel, Professor of Engineering and Applied Science; Tompkins 107, Telephone 676-6749

CIVIL ENGINEERING

168 Introductory Soil Mechanics (3)

Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120 *Introduction to the Mechanics of Solids (3)* and ME 126 *Fluid Mechanics (3).*

191 Metal Structures (3)

Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction. Prerequisite: CE 122 *Structural Theory II (3).*

192 Reinforced Concrete Structures (3)

Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121 *Structural Theory I (3).*

201 Design of Metal Structures (3)

Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent.

202 Design of Reinforced Concrete Structures (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent.

203 Prestressed Concrete Structures (3)

Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent.

206 Foundation Engineering (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of department.

253 Failure and Reliability Analysis of Engineering Structures (3)

Operational and structural failure mechanisms; instability, fracture, and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Prerequisite: ApSc 115 or equivalent.

254 Special Topics in Structural Engineering (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 *Methods of Structural Analysis (3),* and approval of department. Topic to be announced in the *Schedule of Classes.*

255 Coastal Processes (3)

Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport of sandy dune stabilization, sediment tracing. Prerequisite: approval of department.

258 Harbor and Coastal Engineering II (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equipment. Prerequisite: CE 252 *General Structural Dynamics (3)* or equivalent; CE 257 *Harbor and Coastal Engineering I (3).*

261 Analysis of Plates and Shells (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status.

263 Theory of Structural Stability (3)

General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures; effect of imperfections and boundary conditions. Prerequisite: graduate status.

271 Theoretical Marine Hydromechanics (3)

Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of department.

274 Mechanics of Water Waves (3)

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: ME 221 or equivalent and permission of instructor.

275 Special Topics in Ocean Engineering (3)

Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of department.

NGINEERING SCIENCE

203–4 Probability and Statistics of Metrology (3–3)

Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent.

206 Technology and Human Needs (3)

Sociology of science and technology, the solar systems and earth, population, nonrenewable resources, renewable resources, energy, nuclear energy, renewable energy conversion, environment, productivity, transportation. Prerequisite: approval of department.

208 Energy Conservation (3)

Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, in industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low-energy consumption in large and small edifices. Environmental effects and low-fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of department.

221 Theory of Elasticity I (3)

Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of department.

229 Transformations in Materials (3)

Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of department.

231 Structure of Materials (3)

Space lattices, crystal structures, planes, directions, an-isotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue techniques, moving crystal diffraction, Debye-Scherrer method, x-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of department.

234 Composite Materials (3)

Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of department.

239 Physical Ceramics (3)

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of department.

240 Fracture Mechanics (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261.

263 **Atmospheric Physics for Engineers I** (3)

Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of department.

264 **Atmospheric Physics for Engineers II** (3)

Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of department.

270 **Theoretical Acoustics I** (3)

Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221, ApSc 213, or equivalent.

271 **Random Process Theory I** (3)

Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of department.

272 **Random Process Theory II** (3)

Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271.

273 **Time Series Analysis** (3)

Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; periodogram, Blackman-Tukey and direct filtering methods of spectral estimation; effects of finite length and digitization; variability; coherence. Fast Fourier transform techniques; applications in modern technology. Prerequisite: EngS 271 or approval of department.

274 **Environmental Noise Control** (3)

Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215.

275 **Theoretical Acoustics II** (3)

General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270.

276 **Acoustical and Mechanical Measurements** (3)

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215.

277 **Physical Acoustics** (3)

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275.

278 **Psychological and Physiological Acoustics** (3)

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of department.

279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress.

280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of department.

284 **Numerical Methods in Engineering** (3)

Uses of computers in engineering and science; numerical interpolation, integration and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of department.

285 **Finite Element Methods in Engineering Mechanics** (3)

Formulation of the finite element method through variational principles for structural and continuum mechanics problems. Plane stress, plane strain, three-dimensional elasticity, plate bending, thermal conduction, and potential flow. Techniques of constructing and assembling characteristic elemental matrices, computer implementation of the finite element method. Prerequisite: approval of department.

286 **Analysis and Design of Thin-walled Structures** (3)

Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of department.

287 Automated Design of Complex Structures (3)

Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of department.

289 Special Topics in Theoretical and Applied Mechanics (3)

Prerequisite: approval of department.

298 Research (arr.)

Basic research projects as arranged. May be repeated for credit.

299–300 Thesis Research (3–3)

310 Aeroacoustics (3)

General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275.

311 Nonlinear Acoustics (3)

Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of department.

312 Theory of Random Vibration (3)

Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215.

313 Structural Acoustic Interaction (3)

Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312.

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit.

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

MECHANICAL ENGINEERING

215 Theory of Vibrations (3)

Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of department.

216 Structural Dynamics (3)

Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215.

221 Intermediate Fluid Mechanics (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics; methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of department.

222 Applied Fluid Dynamics (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing-body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effect of wing sweep, area ruling concept; supersonic linearized wing theory; similarity rules. Prerequisite: ME 221 or equivalent.

227 Viscous Flow (3)

Exact solution of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; and ME 221 or equivalent.

235 Compressible Flow (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; and ME 221 or equivalent.

237 Energetics of Fluid Flow I (3)

Energy transformations in fluid flows. Gas dynamics of combustion. Nonuniform flow, mixing. Mechanisms of flow induction. Applications to pumping, propulsion in water, air, and space, and thrust augmentation. Prerequisite: ME 155 *Compressible Fluid Flow (3)* or equivalent.

238 Energetics of Fluid Flow II (3)

Wave processes and their utilization. Static, dynamic, and cryptosteady pressure exchange; energy equalizers and dividers. Advanced concepts of air and marine propulsion. Discussion of various concepts of flow induction, thrust generation, and environmental control. Prerequisite: ME 237 or equivalent.

248 Seminar: Aircraft Design I (3)

Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of department.

257 Energy Technology I

An overall view of energy technology, supply and demand, and the relation among energy, environment, and institutional problems. Regression analysis, forecasting of supply and demand, energy systems modeling, analysis of cycles, Second Law analysis, nuclear energy, and energy transmission. Prerequisite: approval of department.

258 Energy Technology II

Continuation of ME 257. Various forms of solar energy (e.g., heating and cooling, photovoltaics, wind, biomass, ocean thermal gradients), tidal energy, geothermal energy, energy and food production, energy systems design, and energy policy. Prerequisite: ME 257.

270 Aerodynamics of Flight Vehicles (3)

Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent.

271 VTOL Aircraft Technology (3)

Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of department.

273 Principles of Automatic Flight Control (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of department.

274 Principles of Flight Guidance (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273.

275 Stability and Control of Vehicles (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques and frequency response analysis. Prerequisite: approval of department.

276 Mechanics of Space Flight (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of department.

279 Special Topics in Flight Sciences (3)

Current problems and methods in high angle of attack stability and control. Nonlinear aerodynamics in the angle of attack region above the stall. Influence of aircraft design and nonlinear aerodynamic parameters on the poststall stability and control of aircraft. Employment of current experimental techniques and development of equations pertaining to developed

spin and recovery characteristics. Prerequisite: ME 275 or approval o department.

280 **Intermediate Thermodynamics** (3)

Thermodynamic systems; Gibbs equation; potentials, thermodynamic rela tionships, equilibrium and stability. Statistical thermodynamics; probability and macrostates; properties of perfect gases, mixtures and crystals. Ele ments of kinetic theory and its application to transport properties. Intro duction to relativistic thermodynamics. Application to chemical reactions, thermal radiation, magnetic, electric and solid systems. Prerequisite: ap proval of department.

281 **Nonequilibrium Thermodynamics** (3)

Molecular theories of gases; thermodynamic properties and Boltzmann's in tegro-differential equation, the H-theorem and entropy; equations of state and potentials; the equation of change and velocity distribution outside equilibrium; transport properties. Field theory. Constitutive, balance, and Gibbs equations. Variational principles. Application to transport processes in engineering systems. Prerequisite: ME 280.

290 **Kinetic Theory of Gases** (3)

Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribu tion of molecular velocities; Boltzmann H theorem. Molecular interac tions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280.

297 **Special Topics in Fluid Mechanics** (3)

Prerequisite: approval of department.

298 **Research** (arr.)

Research as arranged. May be repeated for credit.

299–300 **Thesis Research** (3–3)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying exam ination. May be repeated for credit.

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

Classics

Chairman: J.E. Ziolkowski, Associate Professor of Classics; T-204, Telephone 676-5125

21–22 **Beginning Hebrew** (3–3) (campus course)

Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and ex pression. Laboratory fee, $17.50 per semester.

23–24 **Intermediate Hebrew** (3–3) (campus course)

Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives.

East Asian Languages and Literatures

Chairman: D.L. Lee, Assistant Professor of Chinese; Library 617, Telephone 676-6728

1–2 **Beginning Mandarin Chinese, Level I** (3–3) (campus course)

Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester.

3–4 **Beginning Mandarin Chinese, Level II** (3–3) (campus course)

Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester.

10 **Chinese Calligraphy** (1) (campus course)

Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit.

13–14 **Reading Chinese for Beginners** (4–4) (campus course)

Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language.

Economics

Chairman: C.T. Stewart, Jr., Professor of Economics; C-624, Telephone 676-6150

Departmental prerequisite: Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18 and 220.

1–2 **Principles of Economics** (3–3)

Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics.

101 **Intermediate Microeconomic Theory** (3)

Analysis of supply, demand, and pricing.

102 **Intermediate Macroeconomic Theory** (3)

Theories of national income determination and growth.

121 **Money and Banking** (3)

Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system.

214 **Economic Models for Energy Policy** (3)

Critical study of economic models relating to energy policy. Examination of assumptions, formulations, interpretations, and applications of these models. For graduate students in fields other than economics. Prerequisite: Econ 217 or equivalent.

217–18 Survey of Economics (3–3)

For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived.

220 Survey of Principles and Issues in Economics (3)

Survey of economic theory and its application to contemporary economic problems. Departmental prerequisite waived.

236 Economics of the Environment and Natural Resources (3)

Analysis of public policy problems relating to the environment, and natural resources development and management.

241–42 Labor Economics (3–3)

Theory of wages and employment, analysis of labor supply and demand. Structural unemployment; occupational choice; labor market discrimination.

243 Seminar: Manpower Policy (3)

Developments leading to expansion of public investment in manpower resources; evaluation of goals and operations of publicly supported programs. Open to undergraduates.

247 Seminar: Industrial Organization (3)

Selected topics in regulatory economics and in antitrust economics during alternate years. Prerequisite: Econ 101 or equivalent.

249 Industrial Organization—The Telecommunications Industry

Structure, size, and importance of the telecommunications industry studied in the context of its regulatory framework. Focus on different segments of the telecommunications industry, and outline of recent technological, competitive, regulatory, and legislative developments. Prerequisite: Econ 101 or equivalent, or permission of instructor.

253 Productivity Analysis (3)

Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels.

259 Income Distribution (3)

Theoretical and empirical analysis of income distribution, including analysis of policies related to income inequality.

Education

Chairman: John Boswell, Professor of Education; C-504, Telephone 676-6940

Departmental prerequisite: A degree from an accredited institution and adequate professional preparation are prerequisite to courses in education numbered from 201 to 400.

100 Special Workshop in Education and Human Development (arr.)

Topics to be announced in the *Schedule of Classes.* May be repeated for credit.

101 Career Choices in Education and Human Services (3)

Introduction to the wide variety of careers available in education and human development services: early childhood through college, museum, rehabilitation, industry, publishing, community, recreation, tourism, and government settings. Visits to selected sites.

112 Measurement and Evaluation (3)

Basic evaluative measurement techniques: selection, administration and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis.

128 Children's Literature (3)

Lecture (2 hours), field work (2 hours). Newer books for children and the children's classics, contribution of literature to child development.

133 Supervised Experience in Education and Human Development Services (3 to 6)

Field work, internship, and instructional practice: (1) adult education and human resource development; (2) college student development experience; (3) higher education; (4) museum education; (5) counseling. Admission by permission of instructor.

162 Foundations of Counseling (3)

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues.

200 Special Workshop in Education and Human Development (arr.)

Topics to be announced in *Schedule of Classes*. May be repeated for credit.

205 Foundations of Curriculum Development (3)

For experienced teachers. Curriculum research and design, issues and trends, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of current field-related problems.

207 Curriculum Design: Procedures and Materials Organization (3 to 6)

For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations.

208 Human Development (3)

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research.

209 Child Development (3)

Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood.

210 Adolescent Development (3)

Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence.

212 Quantitative Methods I: Introduction to Survey Measurement and Research (3)

Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 History of Education (3–3)

Educ 213: education as a major factor in the development of world civilization from the invention of writing to the industrial revolution. Educ 214: evolution of the American school system.

217–18 Philosophy of Education (3–3)

Educ 217: to help students formulate a personal philosophy of education. Educ 218: social foundations of education—forces that shape policies and offerings of the school.

219 Elementary School Classroom Procedures (3)

Current theories of teaching and learning and their application to teaching strategies of elementary school teachers.

222 Foundations of Reading Instruction—Early Childhood and Elementary School (3)

Brief historical and psychological background of reading instruction; study and discussion of widely used approaches, methods, and materials for teaching reading; collection and preparation of specific activities for teaching the various reading skills; demonstrations of classroom instructional techniques.

223 Foundations of Reading Instruction in Content Areas—Intermediate and Secondary School (3)

Brief historical and psychological overview; need for teaching reading on these levels; emphasis on basic diagnostic and instructional methods and techniques; teaching demonstrations of basic reading and study skills in content subjects; study of "readability" of content materials; research and application of formulas.

224 Diagnostic Teaching of Reading (K-6) (3)

Classroom diagnostic techniques for elementary school teachers; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests as well as other measures of evaluation; study of materials; selecting and planning activities suitable for correction of specific problems; application of readability formulas. Prerequisite: at least one previous course in reading.

226 Reading in Secondary School (3)

Extension of diagnostic and instructional techniques in Educ 223; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study and evaluation of materials and teaching procedures; application of readability formulas; class demonstrations of teaching strategies. Admission by permission of instructor.

227 Basic Issues in Elementary Education (3)

Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school.

228 **Instructional Areas in Elementary Education** (3)

Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education.

233 **Audiovisual Education** (3)

Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audiovisual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7.

235 **Analysis of Teaching** (3)

Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program.

236 **Introduction to Education Technology** (3)

Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3)

Application of systems techniques to the development of instructional programs. A workshop design, using multi-media instruction.

241 **Education of the Gifted** (3)

For classroom teachers. Nature and discovery of giftedness, provisions for the gifted in regular classes, experimental projects.

242 **The Teacher and School Administration** (3)

Role of federal, state, and local administrative units; school finance; legal controls; school plant; public support; improving teaching conditions.

243 **Human Relations in Education and Management** (3)

Principles and practices in human relations between and among learner, teacher, and other school personnel, parents, and community.

245 **School and Community** (3)

The school as an important member of a team of social agencies that builds the community.

247 **Post-Secondary Career Education** (3)

Development, current concepts, agencies involved, problems, and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college.

248 **The Teacher and School Supervision** (3)

Nature, organization, human relationships, and techniques.

250 **Counseling Drug Abusers** (3)

Counseling theory and practice applied to drug abusers. Crisis intervention, self-help groups, and family therapy; individual and group counseling.

251 **Foundations of Counseling** (3)

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues.

252 Organization and Administration of Counseling Services (3)

Principles and procedures for designing and implementing counseling services. Admission by permission of instructor.

253 Individual Appraisal in Counseling (3)

Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent.

254 The Middle School (3)

Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent.

255–56 Secondary Education (3–3)

Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices.

257 Career Development and Information (3)

Theories of career development; factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information.

258 Theories and Techniques of Counseling (3)

Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling, including Educ 253 and 257.

259 Administration of the Elementary and Secondary School (3)

For experienced teachers and administrators. Survey of administration, including practices of modern schools.

260 Supervision in the Elementary and Secondary School (3)

For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools.

261 Practicum in Counseling and Human Development (3)

Intensive counseling experience under supervision. Emphasis on relationship dynamics, analysis, recommendations and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258.

263 Human Resource Development: Training and Education (3)

Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development.

264 Design of Training Programs in Human Resource Development (3)

Training, education, and development programs for various client systems will be planned using critical events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor.

269–70 School Business Management (3–3)

Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management.

275 School Finance (3)

Educational financial theory, practice, and control, including methods of financing.

276 Public Relations in School Administration (3)

Purposes, gathering and developing materials, disseminating agencies, publicity media, public participation in policy-making.

278 School Law (3)

Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group.

283 Higher Education in the United States (3)

History, scope, purpose, present status, programs, and trends in higher education in the United States.

284 Administration of Higher Education (3)

Government, organization, and administration of colleges and universities; duties of trustees and administrators.

285 Program Planning, Organization, and Coordination (3)

Focus on the skills and knowledge needed by student affairs professionals, faculty advisors, and college administrators in planning, budgeting, and dealing with policy issues related to campus programming. Includes program proposal preparation.

289 Organization and Administration of Reading Programs (3)

For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program.

291 Planning the School Plant (3)

Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems.

295 Quantitative Methods II: Research Procedures (3)

Required of all candidates for master's degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent.

297 Personnel Administration (3)

Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions.

299–300 Thesis Research (3–3)

Required of M.A. in Ed. degree candidates writing master's theses.

302 Quantitative Methods III: Inferential Techniques (3)

Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor.

304 Practicum in Supervision (3 to 6)

Practical experience in supervision of instruction. Admission by permission of instructor.

306 Quantitative Methods IV: Advanced Research Design (3)

Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent.

316 Recent Developments in Elementary School Social Studies (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 Recent Developments in Elementary School Science (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 Recent Developments in Elementary School Mathematics (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor.

324 Teaching Reading and Study Skills at the College Level (3)

Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor.

325 Curriculum Theory (3)

Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation.

353 Counseling Older Persons (3)

Special considerations and counseling emphases in regard to second careers, retirement adjustments, death and dying.

354 Cross-Cultural Counseling (3)

Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States.

355 Counseling in Groups (3)

Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling.

357 Personal and Social Adjustment (3)

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents.

363 Psychosocial Aspects of Rehabilitation Counseling (3)

Impact of congenital and later disabilities on attitudes, self concepts, and motivations. Implications for client adjustments and counseling strategies. Admission by permission of instructor.

370 College Students and Their Community (3)

Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with their environment. Admission by permission of instructor.

371 Principles and Practices in College Teaching (3)

General principles, methods, techniques, and experimental instructional media for teaching at the college and university level.

372 Internship in College Teaching (3 to 6)

Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor.

373 The Community-Junior College (3)

The two-year college as it relates to secondary education, four-year colleges, and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges.

374 Current Issues in Higher Education (3)

Prerequisite: Educ 283, 284.

375 Foundations of College Student Development (3)

College student development as an integral part of higher education programs.

380 Sensitivity Training: Laboratory Method (3)

A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration.

381 Adult Learning (3)

Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical, and social environment in adult education situations.

382 Instructional Strategies in Adult Learning Programs (3)

Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs.

383 Interviewing-Counseling for Human Resource Developers (3)

Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings.

384 Evaluation of Adult Learning Programs (3)

Evaluation of adult learning programs in business, industry, government, voluntary and community organizations, and agencies.

385 Collective Negotiations in Higher Education (3)

Theory, practice, problems, and issues in collective negotiations in higher education.

386 Current Issues in Adult Learning Programs (3)

For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor.

387 Administration of Adult Learning Programs (3)

Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations.

389 **Consultant-Client Relationships in Human Resource Development** (3)
Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280 *Program Planning in Adult Education (3);* or approval of instructor.

390 **Legal Problems in Higher Education** (3)
Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs.

391 **College and University Curriculum** (3)
Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum.

392 **Financing Higher Education** (3)
Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices.

393 **Practicum in Higher Education** (3 to 6)
Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor.

394 **College and University Governance** (3)
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284.

395 **Problems and Practices in Educational Administrative Organization** (3 to 6)
Application of principles and practices concerned with change and evaluation of educational administration.

399 **Seminar: Applied Educational Administration** (3 to 6)
Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners.

Electrical Engineering and Computer Science

Chairman: Raymond Pickholtz, Professor of Engineering and Applied Science; Tompkins 107, Telephone 676-6083

ELECTRICAL ENGINEERING

150 **Introduction to Microcomputers** (3)
(Formerly EE 152)
Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmeter operations. Different microcomputer architectures. Prerequisite: CSci 153 or permission of instructor.

153 Design of Switching Systems (3)

Introduction to switching logic and combinatorial circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous, and pulse sequential circuits. State-assignment and covers. May be taken for graduate credit except by majors in computer science or computer heuristics, modeling, and numerical methods.

201 Natural Modes and Transients in Electrical Systems (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z-transforms, applications. Prerequisite: graduate status.

202 Linear System Theory I (3)

Graph theory and its application to networks and systems; system description in time and frequency domain; linear spaces and linear operators; mathematical representation of linear systems; analytical and computer solutions of the state equations; transient and steady-state response. Prerequisite: graduate status.

203 Linear System Theory II (3)

System properties; controllability and observability of linear systems; sensitivity and stability analyses. Irreducible realizations of rational transfer-function matrices; canonical forms, state feedback, and state estimators. Linear composite systems. Prerequisite: EE 202.

204 Stochastic Signals and Noise (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. Prerequisite: ApSc 115 or equivalent.

224 Electronics of Lasers (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 *Physical Electronics II (3)* or equivalent.

241 Information Theory (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204.

242 Coding Theory (3)

The PCM Communication System, mathematics of coding; groups, rings, and fields, linear codes: parity and generator matrices, syndromes error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation, cyclic codes: implementation and per-

formance, BCH codes: encoding, decoding, minimum distance, the BCH de coding algorithm, burst-correction codes, convolutional codes, sequentia and Viterbi decoding of convolutional codes. Prerequisite: EE 204.

243 Communication Theory I (3)

Optimum receivers for vector channels and for the additive white Gaus sian noise channel; correlation detectors, matched filters; coherent and non coherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204.

244 Communication Theory II (3)

Schemes for efficient signalling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov-Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243.

245 Signal Detection and Estimation Theory (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent.

***250 Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems.

***251 Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communicaion system. Digital transmission and terminals. Wide-band data transmission. Frequency allocation.

298 Research (arr.)

Research as arranged. May be repeated for credit.

299–300 Thesis Research (3–3)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

* EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

COMPUTER SCIENCE

201 Introduction to Computer Systems (3)

Introduction to programming digital computers in assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Techniques of structured programming. Use of a higher-level procedural language. Stacks and recursion. Prerequisite: CSci or EE 51, CSci 100 *Introduction to Computer Science (3)* or equivalent; and programming experience using an assembly language.

215 Advanced Data Structures and High-Level Algorithms (3)

Exchange sorting, binary search, sparse matrix transpose and multiplication. Stack and queue insertion and deletion. List insertion and deletion, lists of available space. The boundary tag method, the Deutsch-Schorr-Waite algorithm, the Knuth-Morris-Pratt algorithm. Inorder, preorder, and postorder traversal of trees, alpha-beta pruning, Tarjan's UNION and FIND. Depth-first and breadth-first search, Kruskal's algorithm, topological sorting, shortest paths in a graph. Quicksort, heap sort, radix sorting, merge sorting, sorting of files. Binary search trees, including AVL trees, B-trees and tries. Hashing and collision handling. Critical paths and PERT. Prerequisite: CSci 159 *Programming and Data Structures (3).*

219 Interactive Computer Graphics I (3)

Architecture and implementation of display and interaction devices. Interactive graphics programming. Functional capabilities of graphics packages. Implementing a graphics package. 2D and 3D viewing, clipping and transformations. Interaction techniques and human factors. Raster graphics scan-conversion algorithms. Hidden surface and hidden edge removal algorithms. Shading and texturing techniques. Prerequisite or concurrent registration: CSci 159 *Programming and Data Structures (3),* former CSci 214 or permission of instructor.

237 Computing Systems (3)

Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage devices; computer control and interrupt structures. Input-output channels and interfacing problems. Communications in digital computers. Introduction to multiple access and time-sharing systems. Prerequisite: CSci or EE 154 *Digital Computer Design (3).*

255 Analysis and Correctness of Algorithms (3)

(Formerly Formal Languages, Correctness, and Structured Programming)

Basic tools of analysis of algorithms. Space and time measures, O(n) and O[f(n)], computer time versus programmer time. Divide-and-conquer, backtracking, branch-and-bound. Lower bounds on computations. NP-hard and NP-complete problems. Correctness, partial correctness, termination, run-time errors. The inductive assertion method, verification conditions and their generation and proof. Applications to algebraic and assembly languages. Prerequisite: CSci 159 *Programming and Data Structures (3),* or former CSci 214.

263 Digital Computer Programming Systems (3)

Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control, including linking, loading, linkage-edit, relocatability, region size, and status switching. De-

sign of dispatchers and monitors. Design of utility programs. Input-outp programming and control. Communications among components of th operating system. Prerequisite: CSci 208 *Computer Programming (3)*; CS 159 *Programming and Data Structures (3)*, or former CSci 214.

Engineering Administration

Chairman: Sam Rothman, Professor of Engineering Administration; Staughto 101, Telephone 676-7409.

150 Introduction to Engineering Administration (3)

The interrelationships of engineering, science, and management; concep tual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and or ganizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12.

160 Introduction to Engineering Economic Analysis (3)

Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis.

170 Basic Quantitative Methods for Engineering Administration (3)

An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research.

204 Administration of Engineering Contracts (3)

Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services.

207 The Personnel Function for Engineering Administrators (3)

Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment.

210 Engineering Law (3)

Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts.

211–12 Engineering Administration (3–3)

Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, pre-

diction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150 and 160, or equivalent.

214 **Patent Law** (3)

A comprehensive and systematic introduction to the law of patents, trade secrets, trademarks, and copyright, including the preparation and prosecution of patent applications. Management decisions involving intellectual property rights. The role of the research administrator in preserving and perfecting legal rights in innovations.

215 **Ethical Issues in Engineering Administration** (3)

Moral philosophy from which ethical considerations are derived; ethical issues and exemplary problems encountered in the administration of engineering and allied areas. Use of case study method to enhance students' ability to recognize ethical aspects of problem situations and to think analytically and synthetically about such aspects.

221–22 **Environmental Management** (3–3)

The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment and the utilization of our resources. Review of governmental and industrial programs to combat pollution of the air, land, and water. Historical development of legislation dealing with environmental science and resource management. Review of pending legislation involving environmental and energy matters; theoretical aspects of specific management problems; review of tools for decision making.

231 **Program Management** (3)

Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases.

241 **Construction Management I** (3)

Contract negotiations; aspects of contracts and specifications important to management. Construction estimating and cost allocation in heavy and building construction; budgeting and accounting concepts.

242 **Construction Management II** (3)

Construction administration: organization, construction planning, and scheduling. Industrial relations and human factors in construction management, work measurement, programming and progressing, project management and control.

243 **Construction Management III** (3) (campus course)

Managerial problems associated with construction; optimal contractor decision-making; modeling and systems approach to construction management; the search for projects; selection of projects; bidding strategy.

251 **Management of Computer Organizations** (3) (campus course)

Planning, organizing, and control of computer operations. Management of a computer organization as an independent service bureau or as an integral part of a larger organization. Supervision of professional and subprofessional computer personnel. Prerequisite: EAd 254.

253 Production Management (3) (campus course)

Planning, organization, and control of production; forecasting techniques; material management; methods of loading and scheduling production processes; electronic methods in production control. Organization and administration of the plant engineering function with emphasis on maintenance control programs.

254 Automatic Data Processing Systems (3)

Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision-making, business, and society.

255 Administration of Research and Development (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives.

261 Economic Analysis in Engineering Planning (3)

Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy, and permission of instructor.

262 Finance for Engineers (3) (campus course)

Exposition of the financial concepts encountered in engineering situations; financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation.

265 Transportation Management I (3) (campus course)

Integration of social, technical, economic, and political considerations which shape transportation systems and their management. Course material focuses on industry and local, state, and federal government programs in transportation. A management study of a local, regional, or national system will be required.

266 Transportation Management II (3) (campus course)

Legal aspects of transportation systems and their management.

269 Elements of Decision-Making and Problem-Solving (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Model building, testing, solving. Replacement under certainty or risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations.

281 Systems Analysis and Management I (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback.

282 Systems Analysis and Management II (3)

Extension and elaboration of systems analysis techniques, including their

application to industry, input-output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281.

283 **Systems Engineering** (3) (campus course)

Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques.

285 **Seminar: Administrative Problems** (3) (campus course)

Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit.

287 **Systems Modeling and Simulation** (3) (campus course)

Introduction to systems modeling and simulation dealing primarily with industrial, organizational, and control models. Emphasis on analyzing the system performance and designing an improved system using analytical or simulation techniques. Prerequisite: EAd 281, 283 or equivalent, and permission of the instructor.

288 **Technology Issue Analysis—The Engineering Approach** (3) (campus course)

A seminar for technical managers who need the contextual background and intellectual basis for addressing technology issues in the public and private sectors. Technology impact analysis, technology forecasting, and the principles and practices of technology transfer are treated as elements of a systematic approach to informed choice and sound technology decisions.

293 **Technical Enterprises** (3) (campus course)

Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and those within government who depend on technical firms as suppliers.

294 **Marketing of Technology I** (3) (campus course)

Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy.

295 **Management of Technical Information** (3) (campus course)

Needs and objectives of technical information systems, functions involved in technical information, storage and retrieval, abstracting, computer usage in technical information systems, system organization. Prerequisite: EAd 251 or permission of instructor.

297 **Problems in Engineering Administration** (3)

Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. Open to Master's degree candidates in the department.

English

Chairman: J.P. Reesing, Jr., Professor of English; Stuart 407, Telephone 676-6180

Students are tested in the minimum essentials of vocabulary, reading, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students who show marked superiority may be exempted from one or both halves of the English Composition course; those who are inadequately prepared for Engl 10 will be given permission to register for Engl 9 on campus. Engl 9 or 10 is prerequisite to all other courses in English.

ENGLISH COMPOSITION

9 English Composition: Language as Communication (3)
(campus course)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semesters hours of credit; the reading course meets an additional three hours per week for a maximum of 10 weeks. Special fee, $25.

10 English Composition: Language as Communication (3)

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure.

11 English Composition: Language and the Arts and Sciences (3)

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10.

20 The Writing of Reports (3)

Theory and practice in the writing of technical reports. Prerequisite: Engl 9 or 10 and 11.

HUMANITIES

43–44 Classical Humanities (3–3)

Lectures in the origins and development of Western civilization from approximately 3000 B.C. to 1300 A.D. Engl 43 considers the civilization of the Old Testament period and of Classical Greece through readings in the Old Testament, and in Homer, Aeschylus, Sophocles, Euripides, Aristophanes, Herodotus, Thucydides, Plato, and Aristotle. Engl 44 considers the civilization of the Roman Empire and of medieval Europe through readings in Virgil, Tacitus, St. Augustine, Aquinas, and Dante, and in medieval romance. Objective quizzes and one paper.

45–46 Humanities in the Modern World (3–3)

Lectures in the development of Western civilization from the 14th to the 20th centuries. Engl 45 considers Renaissance and Neoclassical culture

through readings in Machiavelli, Cellini, Shakespeare, Cervantes, Bacon, Moliere, and Voltaire. Engl 46 considers aspects of Romanticism and Modernism manifested in works by Goethe, Flaubert, Zola, Nietzsche, Mann, Chekhov, and Joyce. Objective quizzes and one paper.

ENGLISH LITERATURE

51–52 **Introduction to English Literature** (3–3)

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature.

AMERICAN LITERATURE

71–72 **Introduction to American Literature** (3–3)

Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present.

English for International Students

Director: George R. Bozzini, Associate Professor of English; Park Lane Building, 2025 I St., N.W., Suite 120, Telephone 676-7136.

The University's comprehensive program in English for International Students is designed as a service for persons enrolled or planning to enroll in University credit programs, for members of Washington's international community, and for other individuals who wish to improve their command of English through a comprehensive program. Normally, students admitted to the program must have completed the equivalent of an American college-preparatory high school education.

Students entering the program take a battery of placement tests to determine their levels of proficiency in English. Arrangements for testing may be made at the Office of English for International Students at the address indicated above. Testing fee, $10.

20 **Intensive Basic English** (0)

Basic grammar, reading, and vocabulary development; emphasis on oral skills. Course meets fifteen class hours and five monitored laboratory hours per week. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

30 **Intensive Lower-Intermediate English** (0)

Introduction of complex grammatical structures, intensive reading, paragraph-level writing, and further vocabulary development and oral practice. Course meets fifteen class hours and five monitored laboratory hours per week. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0)

Comprehensive review of grammatical structures, enlargement of vocabulary through use of unadapted and technical reading material; development of effective reading strategies; composition focusing on outlining and techniques of exposition. Twenty hours per week including laboratory. Tuition is charged at the rate of eight semester hours; laboratory fee $35.

45 Semi-Intensive Higher-Intermediate English (0)

Practice in composition writing; selective review of problematic grammatical structures; introduction to research techniques; development of reading and speaking skills and expansion of vocabulary through use of unadapted reading materials. Ten class hours per week. Tuition is charged at the rate of five semester hours.

50 English Composition/Research Methods for International Students (3)

An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. Special fee, $25.

Environmental Health*

For further information call David A. Rowley, Assistant Dean, Graduate School of Arts and Sciences, Telephone 676-6210

201 Introduction to Epidemiology and Environmental Health (3)

Open to qualified graduate students. Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

231 Venereal Disease in the Community (3)

A survey course to develop an understanding of venereal disease problems. Etiology, clinical manifestations, diagnosis, prevention, and control. For parents, school teachers, health personnel, and other educators.

240 Environmental Impact Statement Procedures and Environmental Law (3)

The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment.

254 Human Ecology (3)

Ecology—man within the framework of reference—physical and cultural anthropology, geography, sociology, urban planning, public health, and public administration.

256 Introduction to Environmental Health (3)

Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry in carrying out control and preventive practices.

270 Industrial Hygiene (3)

Industrial health hazards: chemical exposure to toxic dusts, metallic fumes and vapors, gases, and organic compounds; physical hazards such as high and low temperature biological effects, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.

* These courses are included in certain interdepartmental programs of the Master of Arts/Master of Science in Special Studies degree which is under the academic jurisdiction of the Graduate School of Arts and Sciences.

293 **Public Health and School Health Methods and Activities** (3)

Relationship between public health and school health. The purpose of the course is to aid the teacher in presenting information in the classroom setting.

301 **Applied Epidemiology and Environmental Health** (3)

Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

Forensic Sciences

Chairman: C. O'Rear, Professor of Forensic Sciences; Samson Hall, Telephone 676-7397 or 676-7319

201 **Forensic Serology I** (3)

Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology.

202 **Instrumental Analysis** (3)

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry.

203 **Examination of Questioned Documents** (3)

Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents.

204 **Firearms and Tool-mark Identification** (3)

Methods for identifying firearms, cartridge casings, tool-marks, tire marks, and footprints.

205 **Personal Identification** (3)

Methods of personal identification based on sketches, fingerprints, voice prints, odontology and study of skeletal remains.

214 **Forensic Psychiatry** (3)

Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Physical Aspects of Forensic Sciences** (3)

Survey of forensic physical sciences; fingerprints, firearm and tool-mark examinations, document examinations, and examinations of trace evidence such as glass, soil, paint, hairs and fibers; crime scene investigations; qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.

221 **Biological Aspects of Forensic Sciences** (3)

Principles of forensic pathology, serology and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials, and the detection of drugs in biological materials.

224 Criminal Law I (3)

Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 Criminal Law II: Evidence (3)

Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 Criminal Law III: Procedure (3)

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Prerequisite: ForS 224.

228 Administration of Criminal Justice (3)

Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

251 Moot Court (3)

Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes. Prerequisite: ForS 224.

254 Selected Topics in the Forensic Sciences (3)

Current issues in research, investigation, and law.

260 Principles of Forensic Medicine (3)

Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 Principles of Forensic Pathology (3)

Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 Drugs of Abuse (3)

Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std. degree candidates; open to others with permission of instructor.

266 Seminar: Modern Trends in Criminal Justice (3)

Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

269 Forensic Toxicology I (3)

Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

274 **Management of Criminal Justice Organizations** (3)

Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

295 **Research** (arr.)

Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

299–300 **Thesis Research** (3–3)

French

See **Romance Languages and Literatures.**

Geodesy*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Building F, Telephone 676-7000 or 946-3557

12 **Plane Surveying** (3)

Basic plane surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Math 30.

13 **Higher Surveying** (3)

Elements of geodetic and hydrographic surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Geod 12 and Math 32.

17 **Elementary Photogrammetry** (3)

Fundamentals of aerial photography, photogrammetric optics, and photographic processes; mathematics of vertical and tilted photographs; stereoscopy and parallax; planning and executing the photogrammetric project; radial triangulation methods; photomaps; oblique and terrestrial photography. Prerequisite: Geod 12, Math 31.

18 **Intermediate Photogrammetry** (3)

Basic theory and practices. Stereoscopic plotting instruments; graphical and computational methods for adjusting strips of aerotriangulation. Method of least squares, statistics and transformations applied to photogrammetry. Prerequisite: Geod 17.

106 **Physical Science Data Analysis** (3)

Elementary analysis of cartographic, geodetic, and oceanographic data. Basic concepts of probability, sample statistics, probability distributions, confidence intervals, estimation and tests of hypotheses as related to cartographic, geodetic, and oceanographic data. Prerequisite: Math 31, and either Cart 1–2 or Geod 150–151.

* Affiliated with the Department of Geography and Regional Science.

110 Map Projections (3)

Elementary theory of projections in cartography and geodesy. Projection of the sphere and ellipsoid on plane, conical, and cylindrical surfaces. Prerequisite: Math 33.

117 Analytic Photogrammetry (3)

Analytic photogrammetry theory and practice: matrix algebra, method of least squares, image coordinate refinement, formulation for analytic photogrammetry, intersection, linearization of equations, space resection, two- and three-photo relative orientation, strip adjustment review, block adjustment. Prerequisite: Math 32, Geod 18.

119 Advanced Mathematical Photogrammetry (3)

Mathematical treatment of resection, intersection, relative orientation, error propagation, adjustment and coordinate transformation using matrix algebra. Derivation of colinearity equations and image coordinate corrections for frame, panoramic, and strip photography. Prerequisite: Geod 17, Math 124.

150 Geometric Geodesy (3)

Principles and formulas basic to theoretical and applied geodesy. Primary emphasis on geometric methods. Prerequisite: Math 33.

151 Physical Geodesy (3)

Physical and celestial methods and application of geodesy. Prerequisite: Geod 150, Phys 1 or 3, Math 33.

156 Geodetic Astronomy (3)

Astronomic determination of longitude, time, azimuth, and latitude. Prerequisite: Math 32, Geod 150.

158 Electronic Surveying and Navigation (3)

An examination of the principles and applications of techniques. Topics include: EM wave propagation, system error identification and analysis, representative surveying systems, baseline radio navigation systems and long line calculations and transformation techniques. Prerequisite: Math 32, Phys 1, Cart 1 or Ocea 11.

160 Adjustment Computations I (3)

Basic adjustment theory. Prerequisite: Geod 106, 150; Math 32, 124.

161 Adjustment Computations II (3)

Topics in advanced adjustment theory. Applications to geodesy and photogrammetry. Prerequisite: Geod 160.

165–66 Space Techniques for Geodesy (3–3)

Determination of the gravitational field, station positions and fundamental physical constants. Basic celestial mechanics, computing techniques and data analysis. Modern data acquisition systems. Prerequisite: Math 33, 124, Geod 150, 151.

Geography and Regional Science

Chairman: E.O. Pederson, Associate Professor of Geography and Regional Science; Quigley's, Telephone 676-6185

1 **Introduction to Geography** (3)
(Formerly Geog 51)
General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts.

2 **Introduction to Economic Geography** (3)
(Formerly Geog 52)
Examination of the basic principles which determine the location of economic activities.

3 **Introduction to Physical Geography** (3)
Processes affecting the character of the physical components of the natural environment. Laboratory fee, $18.

107 **Meteorology** (3)
Weather processes, systems, and controls. Laboratory fee, $18.

108 **Climatology** (3)
Climatic elements and their controls; analysis of world climatic regions.

127 **Population and Settlement** (3)
Patterns of world population; factors contributing to population pressures, growth, and migrations.

132 **Resource Management and Conservation** (3)
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies.

134 **Geography of Energy Resources** (3)
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations.

137 **Environmental Hazards** (3)
Examination of natural hazards in terms of their types, distribution, and impact on human activities.

145 **Cultural Geography** (3)
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations.

146 **Political Geography** (3)
Interrelationships among the human and physical environment and political systems; the organization of political territories.

154 **Geography of the Middle East** (3)
Cultural and physical regional patterns of the Middle East.

161 **Geography of Latin America** (3)

Examination of spatial characteristics of physical and cultural phenomena in Middle and South America.

Geology

Chairman: F.R. Siegel, Professor of Geochemistry; Bell 102, Telephone 676-6190

1–2 **Introductory Geology for Nonscience Majors** (3–3) (campus course)

An introduction, for nonscience majors, to the principal features of the the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, continental drift, origin of life, and evolution. Lecture (2 hours), laboratory (2 hours). Laboratory fee, $15 per semester.

3 **Introductory Geology for Nonscience Majors** (3)

Survey covering the principles of geology. Nonlaboratory course for off-campus students only.

4 **Introductory Geology for Nonscience Majors** (3)

Geological periods, evolution of life on earth. Nonlaboratory course for off-campus students only. Prerequisite: Geol 1 or 3, or permission of instructor.

5 **Environmental Geology** (3) (campus course)

The relation of people and society to natural environments; population evolution and mineral resources; economic, legal, and political aspects. Laboratory fee, $15.

105 **Geological Hazards in Land-Use Planning** (3) (campus course)

An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 5 or 21, or permission of instructor. Laboratory fee, $10.

110 **Mineralogy and Petrology for Environmental Sciences, Oceanography, and Fields Allied to Geology** (3) (campus course)

Lecture and laboratory. Prerequisite: permission of instructor. Laboratory fee, $10.

125 **Marine Geology** (3) (campus course)

Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1–2 or 21–22; or permission of instructor.

175 **Hydrogeology** (3) (campus course)

The occurrence, storage, movement, quality, and problems of pollution of subsurface water, and the hydrologic properties of water-bearing materials. Prerequisite: Geol 111, 122; Math 31; Chem 11–12; or permission of instructor.

189 **Geophysics for Geologists** (3) (campus course)

Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 21-22, Math 31, Phys 1 or 3; or permission of instructor.

Germanic Languages and Literatures

Chairman: C. Steiner, Professor of German; Rice 408, Telephone 676-6195

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year German** (3–3) (campus course)

Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 2: Ger 1.

3–4 **Second-year German** (3–3) (campus course)

Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3.

Hebrew

See **Classics.**

History

Chairman: Lois G. Schwoerer, Professor of History; Lisner Hall 503A, Telephone 676-6230

39–40 **European Civilization in Its World Context** (3–3)

Hist 39: introduction to the political, social, economic, religious, and cultural history of Europe from about 800 A.D. to 1715. Hist 40: from 1715 to the present.

71–72 **Introduction to American History** (3–3)

Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present.

131-32 **History of Germany** (3–3)

Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist. 132: from William II to the present.

145 **Imperial Russia** (3)

From the reign of Peter the Great to World War I.

146 **Soviet Russia** (3)

The Russian Revolution and Soviet rule to the present.

149–50 European Diplomatic History (3–3)

Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157 *20th-Century European Diplomatic History (3).*

163–64 History of Latin America (3–3)

Hist 163: analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: a problems approach to Latin America, 1820 to the present; thematic emphasis on neo-colonialism, corporatism, liberalism, *caudillismo,* modernization, populism, and revolution.

171–72 U.S. Social History (3-3)

Hist 171: daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607-1861. Hist 172: the urban-industrial era from 1861 to present.

181–82 U.S. Diplomatic History (3–3)

American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century.

195 Traditional Civilizations of China and Japan (3)

Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1800.

196 The Modern Transformation of China and Japan (3)

The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present.

201 History and Historians (3)

Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199 *Proseminar: Readings for the History Major (3).*

222 History of U.S. Government Regulation: 1886 to the Present

An overview of the political history of regulation beginning with the legislation creating the Interstate Commerce Commission in 1886.

Human Kinetics and Leisure Studies

Chairman: J.L. Breen, Professor of Human Kinetics and Leisure Studies; K201, Telephone 676-6280

101 Physical Education and Sports in Human Resource Centers (3)

Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum.

104 Introduction to Travel and Tourism (3)

Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism.

105 **Introduction to Adaptive Physical Education and Therapeutic Recreation** (3)

Philosophy, methods, and concepts relating adaptive physical education and therapeutic recreation.

117 **Dance Education** (3)

Organizational, methodological, philosophical, and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157 *Dance Technique Theory (3).*

119 **Creative Dance for Children** (3)

Dance as an expressive art medium for children; concepts, principles, methods, and materials. Emphasis given to dance in elementary education with consideration for special education.

129 **Introduction to Motor Learning** (3)

Concepts of motor skill learning applied to the teaching of movement skills.

135–36 **Dance History** (3-3)

Study of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior.

184 **Workshop** (1 to 3)

Titles announced in *Schedule of Classes.* May be repeated for credit with permission of advisor.

202 **Conceptual Basis of Motor Learning** (3)

Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills.

205 **Perpetual-Motor Programs: Diagnostic-Therapeutic Techniques** (3)

Programs of perceptual-motor therapy and their basic assumptions and diagnostic-therapeutic techniques.

232 **Current Issues in Elementary School Physical Education** (3)

Current philosophy, trends, and research; implications for curriculum, instruction, evaluation.

239 **Administration of Recreation and Tourism Services for Special Populations** (3)

Development of recreation and tourism opportunities for disabled, elderly, and other special populations; emphasis on administrative competencies in community organization, communications, consultation, program development, evaluation, and fiscal management.

240 **Physical Education for the Handicapped** (3)

Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications.

244 **Therapeutic Recreation Practice** (3)

Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, and relationship of therapeutic recreation to total rehabilitation goals.

250 Administration of Travel and Tourism Services (3)

Organization and management concepts, theories, and issues, stressing application of theory through analysis of short case examples drawn from the broader range of the travel and tourism industry.

270 Philosophic Foundations of Dance (3)

Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism.

276 Dance in Society (3)

Anthropological aspects of dance; emphasis on current research and literature.

280 Advanced Workshop (1 to 3)

Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor.

283 Practicum (3 to 6)

Field work, internship and/or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor.

Italian

See **Romance Languages and Literatures.**

Journalism

Chairman: Philip Robbins, Associate Professor of Journalism; Stuart 301, Telephone 676–6225

116 Magazine Layout and Design (3)

Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry.

145 Principles and Problems of Public Relations (3)

Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs.

Management Science*

Chairman: J.F. McCarthy, Jr., Associate Professor of Business Administration; G-205, Telephone 676-7375

118 Introduction to Information Processing (3)

Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SGBA computer. Laboratory fee, $25 (applicable to off-campus locations having access to the SGBA computer center).

†201 **Contemporary Issues in Management** (3)
(Formerly Advanced Administrative Management)

An advanced management course designed to explore contemporary issues of organizations and management. Current literature and recent research findings will be analyzed. Topics include organizational organic structure and dynamics, strategic planning, impact of information technologies, and creative problem solving. Prerequisite: Mgt 200 or equivalent. (Within the School of Government and Business Administration, credit for this course is applicable to the M.S. in Adm. degree only. Within the Graduate School of Arts and Sciences: a required course for the Master of Science in Special Studies, with a concentration in Employment Policy, Human Resource Studies, or Social and Economic Statistics; and an elective course for a concentration in Environmental Science.)

207 **Individual and Group Dynamics in Organizations** (3)
(Formerly Human Behavior in Organizations)

For graduate students who wish to improve their skills in dealing with human behavior in organizations. Theoretical and personal understanding of the roles of interpersonal and group dynamics in management. Focus on individuals and groups in various organizational settings. Intensive work group experience focusing on theory, research, and group analysis. (Within the School of Government and Business Administration, credit for this course is applicable to the M.S. in Adm. degree only. Within the Graduate School of Arts and Sciences: a required course for the Master of Science in Special Studies, with a concentration in Social and Economic Statistics. Within the School of Education and Human Development, a required course in the Master of Arts in Education and Human Development, with a concentration in Human Resource Development.)

241 **Information Systems Development and Application** (3)

An advanced course in information technology, emphasizing philosophies, principles, and practices common to the development and application of information systems. Different approaches are studied, case study ma-

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aduate courses listed here are open to degree candidates for the Master of Science in Administra- Master of Arts in Special Studies, Master of Science in Special Studies, and Master of Arts in ation and Human Development, as indicated under the appropriate course listing. Fully qualified e candidates from schools other than the School of Government and Business Administration, have the necessary prerequisites, can register for up to 12 hours in courses offered by the Ac- ting, Business Administration, and Management Science Departments.

requisite not applicable to M.S. in Adm. and interdisciplinary degree candidates.

terials are evaluated, and the various roles of the technical staff are considered. Prerequisite: Mgt 118. (Within the Graduate School of Arts and Sciences, a required course in the Master of Science in Special Studies, with a concentration in Telecommunication Policy, and an elective for the Social and Economic Statistics option.)

243 **Management of Information Technology** (3)

Advanced course emphasizing principles, practices, and trends in the management of information technology. Case studies. Prerequisite: Mgt 240, 242; or permission of instructor. (Within the Graduate School of Arts and Sciences, an elective course for the Master of Science in Special Studies, with a concentration in Telecommunication Policy.)

244 **Information Systems and Telecommunications** (3)

Principles of telecommunications; applications of telecommunications for the transmission of data communications to enhance the flow of information within an organization. Identifying opportunities for applying technology in ways that will support the efforts of an organization. Terminology, hardware and software considerations, and calculations necessary for the specification and design of telecommunication systems. Prerequisite: Mgt 118. (Within the Graduate School of Arts and Sciences, a required course in the Master of Science in Special Studies, with a concentration in Telecommunication Policy.)

Mathematics

Chairman: T.P.G. Liverman, Professor of Mathematics; Library 719J, Telephone 676-6235

No Mathematics courses numbered 1 to 100 are available for college credit if the student's previous training in mathematics meets the prerequisite for a higher numbered course.

Graduate credit may not be given for Mathematics courses numbered from 101 to 200 without the permission of the department chairman.

*3 **College Algebra** (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry.

*6 **Plane Trigonometry** (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor).

*9 **General Mathematics I** (3)

Logic, sets, foundations of the number system, abstract mathematical systems, groups.

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* The School of Government and Business Administration does not accept credit for this course toward the B.B.A.

10 **General Mathematics II** (3)

Algebra, Euclidean and non-Euclidean geometries, probability and statistics, matrices. Prerequisite: Math 9.

30 **Precalculus** (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry.

31 **Single-Variable Calculus I** (3)

Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Arc length. Conic sections. Prerequisite: Math 30 or equivalent.*

32 **Single-Variable Calculus II** (3)

Calculus of trigonometric functions. Techniques of integration. Taylor formula. L'Hopital's rules. Infinite series; polar coordinates; 3-dimensional vectors. Prerequisite: Math 31.

33 **Multivariable Calculus** (3)

Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32.

41 **Calculus for Economists I** (4)

Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent.*

42 **Calculus for Economists II** (4)

Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41.

†51 **Mathematics for the Social and Management Sciences I** (3)

Notion of function, graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration.

†52 **Mathematics for the Social and Management Sciences II** (3)

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51.

111 **Mathematics for Engineers and Physicists I** (3)

Differential equations, Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33.

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*Math 30 may be waived as a prerequisite by examination on scheduled dates.

†Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52.

112 Mathematics for Engineers and Physicists II (3)

Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111.

124 Introduction to Matrix Theory (3)

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors, Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor.

134 Introduction to Boundary-value Problems (3)

Prerequisite: Math 111 or 142, *Theory of Differential Equations (3).*

139 Advanced Calculus I (3)

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33.

140 Advanced Calculus II (3)

Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent.

153 Introduction to Numerical Analysis (3)

Accuracy and precision. Linear systems and matrices. Direct and iterative methods for solution of linear equations. Sparse matrices. Solution of nonlinear equations. Interpolation and approximate representation of functions, splines. Prerequisite: Math 33 or equivalent and some knowledge of computer programming.

Music

Chairman: George Steiner, Professor of Music; S-102, Telephone 676-6245

3 Introduction to Musical Understanding (3)

Introductory history of musical styles, related to listening; study of music materials and media.

4 Survey of Music Literature (3)

Introductory study of musical forms, structures, and textures; aural analysis of selected literature.

Oceanography*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Building F, Telephone 676-7000 or 946-3557

11 Navigation (3)

Theory of navigation, charts, navigation aids, celestial navigation, shipboard instruments. Prerequisite: one course in college algebra and trigonometry; Engl 10.

* Affiliated with the Department of Geography and Regional Science.

101 Oceanography for Science Majors I (3)

Chemical and physical properties of the oceans; composition of sea water, heat budget, distribution of variables, statics, dynamics, water masses, general circulation of the oceans, underwater sound, and propagation of light. Laboratory and field trips as arranged. Prerequisite or concurrent registration: Math 31, Phys 1 or 3.

102 Oceanography for Science Majors II (3)

Physiography and characteristics of the sea floor, ocean basins and margins. Marine biology and ecology. Laboratory and field trips as arranged. Prerequisite or concurrent registration: Geol 1, 3, or 21; and 3 credit hours of introductory biological science.

103–4 General Oceanography (3–3)

Ocea 103: general circulation of the oceans; waves, tides, and properties of sea water; history and methods. Ocea 104: topography and sediments of the ocean floor; life in the sea; and interrelationships of the marine sciences. Field trips as arranged. Each course may be taken independently.

105 Elementary Geophysics (3)

Gravity, geomagnetism, and seismology in cartography, geodesy, and oceanography. Prerequisite: Math 32, Phys 1 or 3.

106 Physical Science Data Analysis (3)

Elementary analysis of cartographic, geodetic, and oceanographic data. Basic concepts of probability, sample statistics, probability distributions, confidence intervals, estimation and tests of hypotheses as related to cartographic, geodetic, and oceanographic data. Prerequisite: Math 31, Ocea 101 and 102.

107 Introduction to Meteorology (3)

An introduction to meteorology including synoptic meteorology, weather forecasting, general circulation of the atmosphere, and air pollution. Prerequisite: Math 30.

110 Physical Oceanography (3)

Physical properties of sea water, underwater sound, and propagation of light. Currents, heat budget, turbulence, and general circulation and water masses of oceans. Laboratory and field trips as arranged. Prerequisite: Math 32, Ocea 101, Phys 1 or 3.

111 Ocean Waves and Tides (3)

Basic tidal theory; wind waves, seiche, storm surge, and tsunami; analyses and principles of prediction. Field trips as arranged. Prerequisite: Math 32, Ocea 101.

112 Biological Oceanography (3)

The study of life in the sea. Biogeography, description, systematics, characteristics of ecology of marine animal and plant groups. Primary productivity and organic food cycles. Biological sampling procedures. Bioluminescence. Symbiotic relationships. Biodeterioration processes and pollution problems. Laboratory and field trips as arranged. Prerequisite: Ocea 102, and 3 credit hours of introductory biological science.

113 Marine Geophysics (3)

Principles of marine geophysical measurements and interpretation. Prerequisite: Ocea 105, Phys 1 or 3.

114 Chemical Oceanography (3)

Chemical processes in the marine environment, including composition of sea water, nutrients, natural composition and variation, carbonate cycle, and extraction. Prerequisite: Chem 12, Ocea 101.

115 Geological Oceanography (3)

Physiography of the sea floor and processes active in ocean basins and margins. Laboratory and field trips as arranged. Prerequisite: Ocea 102, 105, Geol 1 or 3 or 21.

120 Coastal Ecology (3)

Coastal ecosystems and how they function; the impact of man's activities. Impact of specific topical activities. Prerequisite: Ocea 101, 102, or 103–4.

122 The United States and the Oceans (3)

Tracing the nation's involvements in marine affairs; the effect upon domestic policy regarding alternative ocean uses.

124 Introduction to the Law of the Sea (3)

The changing role of the oceans in international relations: marine activities and ocean law, evolution of the law of the sea since 1960, analysis of major categories of ocean use.

130 Fisheries Biology and Management (3)

Examination of ocean and fresh water yields; emphasis on effect on populations fished, maximum and optimum yields, and various purposes of fisheries regulation.

132 Environmental Influences on Marine Living Resources (3)

The relations between living marine resources and the environment. Climate conditions which determine oceanic conditions. The effect of fluctuations in environmental conditions on distribution and/or abundance of resource species. Prerequisite: Ocea 101, 102, or Ocea 103–4.

135 Oceanographic Instrumentation (3)

Techniques and problems in making oceanographic measurements. Various sensors are discussed with respect to their characteristics, design and application. Ocean engineering related to measurement techniques. Prerequisite: Ocea 101 and 102, 105, Phys 1.

Oral Biology

Program Advisor: E.A. Caress, Assistant Dean, Graduate School of Arts and Sciences; Bacon 201, Telephone 676-6210

The courses listed below are open only to students in the Master of Science in Special Studies degree program, with a concentration in oral biology. This degree program is offered by the Graduate School of Arts and Sciences in cooperation with the Army Institute of Dental Research at the Walter Reed Army Medical Center (see page 71).

207 Physical Diagnosis (1)

208 Biochemistry (1)

209 Pharmacology (1)

210 Microbiology (2)

211 Biostatistics and Research Methodology I (2)

212 Biostatistics and Research Methodology II (1)

213 Oral Pathology I (2)

214 Oral Pathology II (2)

215 Human Anatomy (1)

216 Dental Materials (1)

218 Perspectives in Clinical Human Nutrition (1)

Pharmacology

Chairman: H.G. Mandel, Professor of Pharmacology; Ross 640, Telephone 676-3541

115 Nonmedical Use of Licit and Illicit Drugs (3)

Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites.

215 Adolescent Drug Abuse (3)

Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse.

Philosophy

Chairman: R.H. Schlagel, Professor of Philosophy; Rice 611, Telephone 676-6265

45 Introduction to Logic (3) (campus course)

Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic.

50 Introduction to Philosophy (3) (campus course)

Readings from major philosophers and study of philosophic positions from Plato to Sartre.

133 Philosophy, Nonviolence, and the Problem of War (3) (campus course)

Problems of war in relation to morality; theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war.

Physics

Chairman: F. Prats, Professor of Physics; Corcoran 103, Telephone 676-6275

ASTRONOMY

9–10 **Introduction to Astronomy** (3–3) (campus course)

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $11 per semester.

PHYSICS

1 **Foundations of Physics** (4) (campus course)

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $18.

2 **Introduction to Modern Physics** (4) (campus course)

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $18.

3 **Foundations of Physics** (3)

Same as Phys 1 without laboratory. May not be taken for credit by students who have completed, or are enrolled in or plan to enroll in Phys 1.

4 **Introduction to Modern Physics** (3)

Same as Phys 2 without laboratory. May not be taken for credit by students who have completed, or are enrolled in or plan to enroll in Phys 2.

Political Science

Chairman: B. Reich, Professor of Political Science and International Affairs; C-625, Telephone 676-6290

Departmental prerequisite: PSc 1 and 2 (or their equivalent) are prerequisite to all second-group courses in political science.

1 **Introduction to Comparative and International Politics** (3)

Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies.

2 Introduction to American Politics and Government (3)
Structure, powers, and processes of the American political system.

104 Methods of Public Policy Analysis (3)
Models and case studies of public policy formation and changes, techniques of policy analysis and evaluation, normative implications of alternative policy-making frameworks.

105 Political Theory: Major Issues of Western Political Thought I (3)
Foundations of Western political thought—Plato to Aquinas.

106 Political Theory: Major Issues of Western Political Thought II (3)
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau.

110 American Political Thought (3)
Political thought in the U.S. from colonial times to the present as seen through major representative writings.

111 State and Urban Politics (3)
Comparative analysis of context, institutions, processes, and policies of state and urban political systems.

112 State and Urban Policy Problems (3)
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings.

114 U.S. Constitutional Law and Politics I (3)
Separation of powers, federal-state relationships, economic regulation.

115 U.S. Constitutional Law and Politics II (3)
Political and civil rights.

116 The American Presidency (3)
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance.

117 Public Administration and Bureaucratic Politics (3)
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation.

118 Legislative Process (3)
Theory, structure, and process of the U.S. Congress, with emphasis on elections, party organization, committees, and floor procedure, in the context of executive-legislative relations and interest-group activities.

119 U.S. Political Parties and Politics (3)
Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches.

122 Science, Technology, and Politics (3)
Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology.

130 Comparative Government and Politics I (3)

Comparative political analysis with primary focus on the principal states of Western Europe.

131 Comparative Government and Politics II (3)

Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe.

140 International Politics (3)

International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy.

142 International Organizations (3)

Development and operations of the United Nations, regional organizations, and functional international organizations.

144 Public International Law (3)

Survey of international law; emphasis on development and trends.

146 U. S. Foreign Policy (3)

Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy.

170 Governments and Politics of China and Japan (3)

Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts.

173 Governments and Politics of South and Southeast Asia (3)

Interaction of traditional, colonial, and contemporary influences in the domestic and international politics of the Indian subcontinent and of mainland and insular southeast Asia.

177 Governments and Politics of the Middle East (3)

Politics of the eastern Arab states, Turkey, Iran, Israel.

178 International Relations of the Middle East (3)

Analysis of the regional and international relations of the Middle East.

180 Governments and Politics of North Africa (3)

Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East.

181 Politics of Middle and Southern Africa (3)

Comparative analysis of political systems in selected countries of non-Mediterranean Africa.

203 Public Policy Analysis (3)

Reading and research on systematic methods of public policy analysis.

204 Methods of Legislative Research (3)

The process of empirical research: construction of research design, data collection, and analysis. Techniques discussed will include content analysis, survey research, and analysis of institutional voting.

212 Urban Politics (3)

The socioeconomic, demographic, and cultural context of urban politics; informal patterns of power and influence in urban decision-making; formal institutions and policy-making processes; urban policies and their impacts.

215 Judicial Policy-making (3)

Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues.

216 American Presidency (3)

Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making.

217 Bureaucratic Politics (3)

Structure and operation of governmental bureaucracy with particular emphasis on the politics of formulating and implementing public policy.

218 Legislative Theory and Behavior (3)

Organization, behavior, and policy outputs of the U.S. Congress.

219 American Political Parties and Electoral Behavior (3)

Nature and functions of political parties, with special emphasis on party influences on electoral behavior and congressional decision-making.

220 Public Opinion and Political Socialization (3)

Sources and dynamics of public opinion and political socialization.

222 Government, Science, and Technology (3)

National and international policy issues which arise from the interaction between scientific and technological development and governmental activity.

223 Science, Technology, and Public Affairs (3)

Selected public policy issues with significant scientific or technological aspects.

224 Domestic Policy Analysis—Selected Topics (3)

Analysis of U.S. policy toward selected domestic problems.

225 Economic Policy Analysis—Selected Topics (3)

Analysis of selected topics in U.S. monetary and fiscal policy.

226 Legislative Elements in Economic Policy Development (3)

Economic analysis of selected legislative issues and the effect of various economic pressures on policy outcomes.

230 Comparative Government and Politics I (3)

Examination of basic approaches to comparative politics.

231 Comparative Government and Politics II (3)

Comprehensive examination of specific issue areas in comparative political analysis.

234 Comparative Legislative Systems (3)

Selected problems of legislative theory and behavior from a comparative perspective with particular reference to the parliamentary systems of West Germany, France, and Britain.

246 U.S. Foreign Policy (3)

Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution.

249 U.S. National Security Policy (3)

Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance.

250 Foreign Policy Analysis—Selected Topics (3)

Analysis of U.S. foreign policy toward selected world regions.

269 Soviet Military Policy and Strategy (3)

Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought.

286 Selected Topics in American Politics (3)

Readings and discussion.

Portuguese

See **Romance Languages and Literatures.**

Psychology

Chairman: R.D. Walk, Professor of Psychology; GG-202, Telephone 676-6320

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

1 General Psychology (3)

Fundamental principles underlying human behavior.

8 Psychology of Motivation and Personality (3)

Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized.

22 Introduction to Educational Psychology (3)

The contributions of psychology to education; emphasis on learning.

25 The Theory and Practice of Counseling Special Populations (6)

The organic and behavioral bases for abuse of alcohol and drugs. Special focus on medical, psychological, and psychiatric issues. Social, economic, political, and legal systems in relation to abuse, and psychological techniques for helping the abuser develop independence from the habit. A synthesis of modern counseling techniques emphasized.

29 Psychology of Childhood (3)

Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.

101 Abnormal Psychology (3)

Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders.

112 Psychology of Adolescence (3)

Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to solution of such problems.

121 Psychology of Learning (3)

Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects.

129 Theories of Personality (3)

Survey of personality theories; emphasis on their application to problems of individuals.

131 Psychological Tests (3)

Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $7.

144 Personnel and Industrial Psychology (3)

Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity.

145 Psychology of Management (3)

Psychological aspects of managing work organizations. Departmental prerequisite waived.

146 Psychotechnology of Learning and Training (3)

Psychological principles, concepts, and techniques of human learning and behavior modification as applied to the design and operation of training and development systems.

150 Psychology of Sex Differences (3)

Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 Social Psychology (3)

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism and war.

156 Psychology of Attitudes and Public Opinion (3)

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare.

175 Career Development in Youth and Maturity (3)

Emphasis on the development of long-range career objectives based on review of experiences, results of psychological testing, seminar discussion groups, and guided independent study. Analysis and practice of the specific skills needed to negotiate for advancement or to accomplish a career change.

191 Independent Research in Psychology (3) (campus course)

Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit.

211 Assessment of Cognitive Functioning (3)

Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $7. Admission by permission of instructor.

245 Seminar: Organizational Behavior (3)

Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design.

246 Seminar: Personnel Evaluation Techniques (3)

Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

248 Organizational Behavior Research Applied to Organizational Intervention and Change (3)

Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program-evaluation criteria. Offered only as part of the Graduate School of Arts and Sciences' program in social and organizational behavior.

251 Seminar: Advanced Social Psychology (3)

Current research and theory: motivation and cognition, dissonance, social interaction theory, interpersonal processes, group dynamics, group conflict. Offered only as part of the Graduate School of Arts and Sciences' program in social and organizational behavior.

291 Theories of Organizational Behavior (3)

Examination of current theoretical models and research. Offered only as part of the Graduate School of Arts and Sciences' program in social and organizational behavior.

Public Administration*

Chairman: C.W. Washington, Associate Professor of Public Administration; 2401 Virginia Ave., Telephone 676-6295

213 **Administration in the Federal Government** (3)

Critical analysis of the structure and administration of the federal government from both a managerial and political perspective. Emphasis on executive branch organization, integration, and coordination, as well as current trends in government regulation, accountability, and effectiveness. (An elective course for the Master of Science in Special Studies, with a concentration in Environmental Science.)

223 **Behavioral Factors in Large and Complex Organizations** (3)

Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns; dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations; influence and control systems. Future trends. (A required course for the Master of Arts in Special Studies, with a concentration in Social and Organizational Behavior.)

252 **Public Expenditure Analysis and Planning** (3)

Intensive analysis of the concepts and principles of economics as applied to the public sector and the analytic techniques used by government agencies for planning, allocating, and managing scarce resources in the implementation of public programs. Topics discussed include benefit-cost analysis, program budgeting, productivity, and performance measurement. (An elective course in the Master of Science in Special Studies, with a concentration in Social and Economic Statistics.)

261 **Policy Analysis in Public Administration** (3)

Concepts and issues in public policy analysis. Theoretical problems encountered in policy analysis. The role and limits of analytic techniques in the development, implementation, and evaluation of public policy. (A required course for the Master of Science in Special Studies, with a concentration in Employment Policy or Human Resource Studies.)

Regulatory Policy

Program Advisor: D.A. Rowley, Assistant Dean, Graduate School of Arts and Sciences; Bacon 201, Telephone 676-6210

The courses listed below are open to students in the program of study leading to the degree of Master of Science in Special Studies with a concentration in regulatory policy. Courses may be open to qualified non-degree students as space is available. This degree program is offered by the Graduate School of Arts and Sciences (see page 59).

*Graduate courses listed here are open to degree candidates for the Master of Science in Administration, Master of Arts in Special Studies, Master of Science in Special Studies, and Master of Arts in Education and Human Development, as indicated under the appropriate course listing.

210 Administrative Law for Non-Lawyers (3)

Legal standards governing decision-making in the executive and independent regulatory agencies. Major topics include: judicial review, adjudication, formal and informal rule making, due process, executive discretion, and evidentiary standards.

220 Regulated Industries (3)

Planning, promotion, and policing of the behavior of firms through regulation. Economic justifications for regulation and deregulation. Judicial review of regulatory agency decisions.

230 Evidence in the Regulatory Process (3)

Regulatory agency hearings and comment procedures. Preparation of exhibits and testimony. The relation of attorneys and economists in case preparation. Coordination of economists, engineers, accountants, geologists, and other experts. Cross-examination of expert witnesses. Standards of evidentiary proof. Evidentiary issues in appellate advocacy and judicial review.

280 Seminar: Current Topics in Regulation (3)

Religion

Chairman: H.E. Yeide, Jr., Professor of Religion; O-102A, Telephone 676-6325

9 The Hebrew Scriptures (3)

Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities.

10 The New Testament (3)

Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles.

21 Religion and Man's Search for Meaning (3)

Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society.

22 Religion and Contemporary Social Issues (3)

Illumination of social problems by ethical reflection; examination of ethical perspectives as stimuli and barriers to social change; techniques for maintaining social values and seeking change.

59 Religions of the East (3)

Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto.

60 Religions of the West and Near East (3)

History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments.

127 Medicine, Religion, and Healing (1) (campus course)

Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics.

216 Supervised Clinical Pastoral Education (I-A) (6)

Full-time program of clinical pastoral education in an approved center. Involvement in the responsibility for pastoral ministry is reviewed and evaluated in a peer-group context.

217 Supervised Clinical Pastoral Education (I-B) (6)

A continuation of Rel 216 with emphasis on pastoral and personal identity, sustained pastoral relationships, and pastoral methods and skills.

218 Supervised Clinical Pastoral Education (III-A) (6)

Responsibility in pastoral ministry is increased with emphasis on group work, interprofessional involvement, use of specific counseling methods, work with persons with special problems. Prerequisite: Rel 216 and 217, or equivalent.

219 Supervised Clinical Pastoral Education (III-B) (6)

Continuation of Rel 218 with emphasis on examination and review of administrative procedures, design of pastoral programs, and development of pastoral theology.

222 Seminar: Ethics (3) (campus course)

Selected topics.

235 Seminar: Roman Catholicism in the Modern World (3) (campus course)

Important leaders and their ideas in selected developments since 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical. Emphasis on 20th century.

237 Seminar: Theological Analysis (3) (campus course)

Historical and topical study of the development of important ideas in such areas as Christology, ecclesiology, and death.

299–300 **Thesis Research** (3–3) (campus course)

Romance Languages and Literatures

Chairman: G.E. Mazzeo, Professor of Romance Languages; Monroe 411, Telephone 676-6330

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

1–2 **First-year French** (3–3) (campus course)

A year course; credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, com-

position, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 Second-year French (3–3) (campus course)

A year course; credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2. Laboratory fee, $17.50 per semester.

ITALIAN

1–2 First-year Italian (3–3) (campus course)

A year course; credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 Second-year Italian (3–3) (campus course)

A year course; credit toward a degree at this University given on completion of Ital 4. Conversation, grammar review, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Prerequisite: Ital 1–2. Laboratory fee, $17.50 per semester.

PORTUGUESE

31–32 Intensive Portuguese (3–3) (campus course)

Prerequisite: knowledge of one other Romance language.

SPANISH

1–2 First-year Spanish (3–3) (campus course)

A year course; credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 Second-year Spanish (3–3) (campus course)

A year course; credit toward a degree at this University given on completion of Span 4. Conversation, grammar review, composition, reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2. Laboratory fee, $17.50 per semester.

Slavic Languages and Literatures

Chairman: C.A. Moser, Professor of Slavic; Library 627, Telephone 676-6335.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 First-year Russian (3–3) (campus course)

Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 per semester.

3–4 **Second-year Russian** (3–3) (campus course)

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1–2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester.

9–10 **Intermediate Russian Conversation and Composition** (3–3) (campus course)

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor.

91–92 **Introduction to Russian Literature** (3–3)

Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English.

109–10 **Advanced Russian Conversation and Composition** (3/3)

Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent.

161–62 **Russian Culture** (3–3)

Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports.

165 **Soviet Literature from the Revolution to World War II** (3)

Basic themes, trends, and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English.

166 **Soviet Literature from World War II to the Present** (3)

Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s and 1970s. Lectures, discussions, reports—in English.

178 **Women in Russian Literature** (3)

The unique role of women in Russian literature. Reading and discussion of major works by Russian women writers—in English.

Sociology

Chairman: P.L. Stewart, Associate Professor of Sociology; D-201B, Telephone 676-6345

Departmental prerequisite: Soc 1 is prerequisite to all courses in Sociology except for Soc 181 and 191.

1 **Introductory Sociology** (3)

General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior.

2 **Major Social Issues** (3)

Critical examination of three selected social issues in contemporary American society.

101 Development of Social Thought (3)

An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories.

124 Medical Sociology (3)

Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services.

126 Urban Sociology (3)

The sociological dynamics of the city and of urban growth in the United States; urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition, and revolt.

127 Population Problems (3)

Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control.

129 Race and Minority Groups (3)

Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice.

130 Class, Status, and Power (3)

Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions.

135 Youth and Delinquency (3)

Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control.

136 Criminology (3)

Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society.

137 Sociology of Law (3)

Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law.

139 Deviance and Control (3)

Analysis of the development of primary deviance through processes of socialization; analysis of the creation of secondary deviance through collective definitions and responses, within varying historical, political, and social contexts.

140–41 Social Research Methods (3–3)

Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140.

143 Social Movements (3)

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions.

149 Modern Sociological Theory (3)

Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101.

153 Poverty in America (3)

Interdepartmental course offered by the Departments of Sociology and Economics. Exploration of social and economic causes of poverty in the United States and evaluation of anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low-income groups.

155 Women, Sex Roles, and Socialization (3)

Analysis of the social-structural and personality theories and empirical research on sex role socialization in contemporary society. Topics include sexual inequality, women's changing place in the occupational structure, and social change and the women's movement.

160 Death and Dying: A Sociological Perspective (3)

Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy.

181 Major Social Processes (3)

Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. A laboratory fee of $5 may be charged.

191 Current Emphases in Sociology (3)

Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit. Admission by permission of instructor.

201 Concepts of Sociology (3)

Systematic survey, critical analysis of sociological concepts. Emphasis on theoretical systems. Topic changes each semester; may be repeated for credit. Admission by permission of instructor.

202 Uses of Sociology (3)

Examination of empirical research based upon theoretical perspectives introduced in Soc 201. Introduction to social research methods.

203 Social Organization (3)

Introduction to sociological concepts and perspectives on society as a system of institutions. Recommended for students offering sociology as a supporting field.

210 Theoretical Foundations of Political Sociology (3)

Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change.

211 Seminar: Social Change (3)

Comparative study of political processes concentrating on political development in Third World nations.

228 Introduction to Urban Social Problems (3)

Analysis of urban social theories and paradigms used in urban analysis; historical development of urban centers, including growth, development, and change in society's perceptions of problems; examinations of legislative changes and policy-making as they apply to urban areas.

229 Analysis of Urban Social Problems (3)

Examination of specific urban social problems. Effects of density on population, demographic changes in population, poverty in relation to urban problems, child abuse and family problems, prognosis for future of urban areas.

240 Sociology of Work and Occupations (3)

Review of major theoretical and empirical developments in industrial sociology; varying approaches to the study of work and occupations.

241 Sociology of Work and Organizations (3)

Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision-making, recruitment, allocation of authority, informal organization, and interorganizational relations.

248 Seminar: Organizational Theory and Behavior (3)

Advanced analysis of theory and behavior in complex organizations relative to defining organizations, examining basic social processes and their relationship to the cultural environment.

252 Seminar: Sociology and Social Policy (3)

Concepts, theory and research which demonstrate the applicability of a sociological perspective (for example, views on social systems, roles, formal organization, power, stratification, decision-making, social values) to the policy process.

254 Seminar: Methods in Social Policy Research (3)

Offered jointly by the Educational Policy Program and Sociology Department. Systematic survey of conceptualization, design, and practice of evaluation research of social experiments, and of simulation and technological forecasting. Prerequisite: Stat 105, Soc 230, 252; or permission of instructor.

***259 Law and Criminology I: Search for the Causes of Criminal Behavior (3)**

Same as Law 475(2)

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* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to one additional semester hour. For description of the courses, see the *National Law Center Bulletin*.

*261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3)

Same as Law 476(2)

262 **Seminar: Police and the Community** (3)

Analysis of contemporary urban law enforcement, including policing "styles," civil disorder, police-community relations, and competing perspectives on the place of police agencies in civil society.

263 **Seminar: Law and Society** (3)

Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes.

270 **Educational Sociology** (3)

Analysis of educational systems from institutional perspectives and as agencies of socialization; relationships of education in general to society, including technological, communal, and subcultural components.

271 **Sociology of the Youthful Offender** (3)

Factors of delinquency, juvenile detention, the juvenile court, training schools, treatment of offenders.

273 **Deviant Behavior** (3)

Analysis of relationships of society, socialization, and deviancy. Social responses to deviancy and criminal offenders; rehabilitative programs in community, courts, and schools.

274 **Human Sexuality** (3)

A synthesis of theoretical perspectives from which analysis of various forms of sexual behavior and problems related to sexuality will be undertaken.

295 **Research** (arr.)

Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit.

Spanish

See **Romance Languages and Literatures.**

* Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to one additional semester hour. For description of the courses, see the *National Law Center Bulletin.*

Special Education

Chairman: R.K. Ives, Professor of Special Education; C-524, Telephone 676-6170

200 Psychosocial Development of Young Exceptional Children (3)

The relationship between psychosocial development of the exceptional child and psychosocial development in general. Admission by permission of instructor.

201 Introduction to Special Education (3)

Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accommodate children in a school program.

230 Vocational/Special Education Assessment of the Secondary Level Handicapped Student (6)

Individual study of methods and materials used in vocational assessment including formal and informal tests to determine vocational interests and aptitudes, academic performance, learning style and behavioral readiness.

231 Selected Vocational/Special Education Methods and Materials (3)

Selected materials and techniques used in teaching and programming for the secondary school level handicapped person in academic, career, leisure, and occupational skill areas.

232 Practicum: Vocational/Special Education (3)

Placement in at least three to five different sites offering programs in the areas of pre-vocational, industrial arts, and vocational programming that serve the adolescent student.

233 Curriculum for Vocational/Special Education (3)

Examples and practice in designing and implementing academic, self-help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped.

234 Seminar in Vocational/Special Education (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with SpEd 295.

235 Coordination of Job Placement Programs in Vocational/Special Education (3)

Examples and programming considerations for the development and coordination of an adolescent job placement program.

236 Secondary Career Planning for the Handicapped (3)

Legislative issues and the on-going process of career decision-making by the handicapped person who is completing a secondary school level program.

260 Developmental Assessment of Young Exceptional Children (3)

Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor.

261 **Practicum: Methods and Materials for Young Exceptional Children** (6)

Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires ten hours a week in service.

262 **Seminar: the Education of Young Exceptional Children** (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young exceptional children. Must be taken concurrently with SpEd 292. Admission by permission of instructor.

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3)

Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience.

264 **The Severely and Profoundly Handicapped Child: Methods and Techniques** (3)

Specialized programs, techniques, and methods for teaching children with severe disabilities.

266 **The Development of Language in Young Exceptional Children** (3)

Introduction to the study of language acquisition and the application of current research on language of handicapped children.

267 **The Early Childhood Special Educator: A Survey of Roles and Services** (3)

Examination of the spectrum of roles available in early childhood special education; emphasis on role expectations and psychosocial dynamics of the various settings.

268 **The Development of Young Exceptional Children with Emphasis on Handicapping Conditions** (3)

Lecture (2 hours), site visitation (3 hours), discussion (1 hour).

269 **Multidisciplinary Theory in Special Education** (3)

Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships.

270 **Mainstreaming: Adapting Attitudes, Programs, and Curriculum to Meet the Needs of the Special Child** (3)

Review of the basic curriculum areas as they relate to the development of readiness skills in special education.

271 **The Interdisciplinary Approach to Planning for the Exceptional Child: Theory and Practice** (3 to 6)

Theory of, and field experience in, interdisciplinary team functioning.

273 Seminar for Special Education Strategist Intern (3 or 6)

Weekly seminar dealing with experiences, problems, and concerns encountered during special education/early childhood strategist internship. Concurrent enrollment in SpEd 293 required.

290 Control and Management Techniques for the Young Exceptional Child (3)

Examination of the theory, techniques, and tools essential for effective classroom management. Admission by permission of instructor.

292 Professional Internship in Education of Young Exceptional Children (6 or 9)

Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. Must be taken concurrently with SpEd 262.

293 Professional Internship for the Special Education/Early Childhood Strategist (6 to 9)

Supervised internship in strategist role, emphasizing diversified, multidimensional aspects of a special education/early childhood program. A minimum of 420 clock hours is required. Concurrent enrollment in SpEd 273 required.

295 Professional Internship in Vocational/Special Education (9)

Supervised internship in the vocational/special education of adolescent handicapped youth, emphasizing the diversified, multi-dimensional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with SpEd 234.

303 Administration and Supervision of Special Education (3)

Philosophy and nature of special education; program organization, administration, and development. Surveying local needs; program evaluation and supervision. Admission by permission of instructor.

306 Dynamics of Family Intervention: Theory and Practice in Special Education (3)

Theoretical foundations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children.

360 Interdisciplinary Techniques in the Diagnostic Process (3)

Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent.

Speech and Drama

Chairman: L.S. Bowling, Professor of Speech and Hearing; Lisner Auditorium B10, Telephone 676-6350

1 Communicative Speaking and Listening (3)

Basic theories and principles of public speaking: research, composition, delivery, and criticism. Recording fee, $5.

11 Voice and Diction (3)

Development of naturalness, correctness, and clarity in conversation through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, $5.

45 Understanding the Theater (3)

The art of the theater; its literature, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for nonmajors.

110 Interpretation (3)
(Formerly SpDr 32)

The study of literature through performance. Interpretation of prose, poetry, and drama.

111 Business and Professional Speaking (3)

Study of the communication process in business and professional organizations; practice in interviewing, preparation and delivery of technical reports, salesmanship, and speeches for special occasions. Primarily for nonmajors.

121 Group Discussion and Conference Leadership (3)

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1 or permission of instructor.

Statistics

Chairman: H.W. Lilliefors, Professor of Statistics; C-315, Telephone 676-6356

Departmental prerequisite: One entrance unit in algebra is prerequisite to all first-group courses in statistics.

***†51 Introduction to Business and Economic Statistics** (3)
(campus course)

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation, time series, index numbers.

†53 Introduction to Statistics in Social Science (3)

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, test of hypotheses, regression and correlation.

97 Introduction to Computer Programming (3)

Lecture (2 hours), laboratory (2 hours). Computer and programming concepts. High-level language programs written by students will be run on the University computer. Laboratory fee, $25.

* Stat 101, which is only offered off campus, may be substituted.
† Stat 51, 53, 101, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

***101–2 Basic Principles of Statistical Methods (3–3)**

Variables and attributes, averages and dispersion, elementary principles of sampling, introduction to the making of statistical decisions. Prerequisite to Stat 102: Stat 101.

105 Statistics in the Behavioral Sciences (3) (campus course)

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or equivalent, and satisfactory performance on a placement examination.

***111 Business and Economic Statistics I (3) (campus course)**

Statistical methods appropriate for applications in economics and business.

112 Business and Economic Statistics II (3) (campus course)

Continuation of Stat 111 with emphasis on techniques of regression, Chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent.

***127 Statistics for the Biological Sciences (3)**

Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design.

211 Introduction to Economic Statistics (3)

A survey of statistical techniques for application to problems in economic analysis. Offered for students in a special studies program only.

Telecommunication Policy

Faculty Advisor: D.A. Rowley, Assistant Dean, Graduate School of Arts and Sciences; Bacon 201, Telephone 676-6210.

240 Seminar in Telecommunication Policy and Regulations (3)

International and domestic telecommunications institutions; the policy and regulatory process; spectrum management; cable telecommunications systems; common carrier/microwave transmissions system; mobile system; broadcasting-AM, FM, UHF, VHF-TV; satellites; United States domestic satellites; mobile satellite system; international telecommunications law; environmental impact; United States government systems; INTELSAT.

* Stat 51, 53, 101, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

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